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United States
Circuit Court of Appeals
 For the Ninth Circuit 1145

Transcript of Record

GEORGE J. HENRY, Jr.,
Complainant.

vs.

CITY OF LOS ANGELES,
Defendant.

VOLUME 5
(Pages 1601 to 2000 Inclusive)

Upon Appeal from the United States District Court for
 the Southern District of California,
 Southern Division

FILED
 JAN 4 - 1918

A. Yes sir. If they stayed in the needleseats it would interfere with the closing of the needles just the same.

Q. 351. But it would not interfere with shutting down the wheel?

A. No sir; when the water is turned out at the main gate it would not.

Q. 352. So, even if the obstructions should remain in the seats, that is, such small things as could come through a 1-inch mesh, they would not interfere with the governing action of the main needle or auxiliary needle under ordinary conditions?

A. While the plant was operating?

Q. 353. Yes; while the plant was operating.

A. Yes sir; they will interfere a little in this way. If they happen to get in under the needle and should stick, it throws the stream off of the needle and does not give it a chance to divide equally in the buckets to get the true efficiency of the wheel.

Q. 354. But it would not interfere with the governing action on the needles?

A. No sir.

Q. 355. It would only act to split up the stream in its projection on the wheel?

A. Yes sir.

Q. 356. The apparatus of Division Creek No. 2 plant has been adjusted by others than yourself during the time of your connection with it, hasn't it?

A. I can't answer that. I don't know. I never have seen it. If it has been, I never saw them do it.

Q. 357. Haven't there been other people there

in connection with the aqueduct department who have overhauled these plants or inspected them as to little details at times?

A. No sir; the only overhauling—well, if they had, it has been without my knowledge of its being done at all.

Q. 358. And there were about five months in 1913 that you were away from the plant?

A. Yes sir.

Q. 359. And you don't know what was done with reference to any adjustments during that period?

A. No sir.

Q. 360. And as a matter of fact during that period the auxiliary valve might have been adjusted without your knowledge after the heavy service of the dredge operated in part or whole by the power from Division Creek No. 2 plant was terminated. Is that not correct? That is, so far as you know.

A. Yes; but there was no one there at the time but the watchman, and I don't think he would touch them.

Q. 361. I mean it might have taken place during the months that you were away?

A. It might have been.

July 12 o'clock
~~June~~ 2, 1914, R. M.

MICHAEL KVAPISHEVSKI, heretofore sworn and examined, was recalled on behalf of defendant, and testified as follows:

DIRECT EXAMINATION

By Mr. Westall:

Q. 21. You have heretofore furnished translations in this case of Defendant's Exhibit French Patent and Defendant's Exhibit Swiss Patent, have you not?

Mr. Blakeslee: We repeat our objections heretofore made with respect to both of these exhibits, on the ground that the objections heretofore registered, including the grounds that the exhibits are not identified, and that one or both of same does not come within the answer of defendant interposed in this case; that these exhibits have not been proven for use in this case. We further object to the questions put to this witness in connection with these exhibits on the ground that the witness is not qualified.

A. Yes, sir.

Q. 22. By Mr. Westall: I now call your attention to certain writings on a drawing accompanying Defendant's Exhibit French Patent, which, at the time of furnishing the translations referred to, was not apparently taken into consideration by you. Will you now please examine the writing referred to on the drawing accompanying the French Patent and furnish a translation thereof, if you understand the language in which it is written and if you are able to do so.

Mr. Blakeslee: Objected to as not the proper method of proof and not the best evidence, no foundation laid for secondary evidence, and on the

further repeated objection that the witness is not qualified, and the former objections made are, of course, repeated throughout this inquiry.

A. Referring to the inscription on the upper left hand corner of the drawing accompanying the French Patent, I find the inscription as translated would read: "Drawing adjoined to patent of 15 years taken the 8th of August, 1899, by the machine factory of Escher, Wyss & Company, incorporated. Paris the 9th of February, 1914. General Secretary of the National Office of Industrial property." The signature appears to be "Broan", but not sufficiently legible to be determined.

The inscription on the lower left hand corner reads as follows in translation: "Paris the 8th of August, 1899. By permission of the machine factory of Escher, Wyss & Company, incorporated." The part first referred to has the red letters in part.

Q. 23. By Mr. Westall: Please examine the impression of the seal partly covering the printed stamp in red.

Mr. Blakeslee: The same objection.

A. The adjoined seal, as far as can be read, shows an impression of the seal of the National Office of Industrial property.

Q. 24. By Mr. Westall: Referring to the seal at the end of the written copy of Defendant's Exhibit French Patent, will you please translate as well as you are able to make out the words of that impression of the seal?

Mr. Blakeslee: The same objection.

A. As far as I can make out, the impression of the adjoined seal reads: "National Office of Industrial Property", and on the right hand side of the margin I find the words, "Fine Arts and Trades."

Mr. Blakeslee: We repeat our objections, even in view of the testimony just taken, which have heretofore been urged with respect to the want of identification of this exhibit, no proof having been adduced as to the authenticity of the purported patent copy or the purported authentication thereof by any consular officer or other official empowered and required to authenticate documents from a source foreign to the United States and its territory.

Mr. Westall: This closes the defendant's case.

PROCEEDINGS IN REBUTTAL

Los Angeles, Cal., February 17, 1915, P. M.

W. W. WILSON, a witness produced on behalf of complainant, being first duly sworn according to law to testify the truth, the whole truth and nothing but the truth, testified as follows, in answer to interrogatories propounded by Mr. Blakeslee:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and occupation.

A. William Webster Wilson; age, thirty-two years; residence, 1339 Fifth Avenue, Los Angeles, California; occupation, vice-president Wilson & Willard Manufacturing Company of this city.

Q. 2. What is the nature of the business of that company?

A. General machine work and manufacturing of oil well tools and machinery.

Q. 3. What is the general nature of your occupation and connection with that company's business?

A. I have charge of the shops and office of that company.

Q. 4. How long have you attended to this kind of work for that company?

A. Since somewhere in the year 1912.

Q. 5. How long have you been engaged in mechanical pursuits?

A. Since I was about fifteen years old.

Q. 6. Have you had any academic training in this direction, and, if so, what?

A. Yes, sir; I am a graduate of the electrical engineering department of Stanford University, graduating in the fall of 1907.

Q. 7. Did you take any other courses at that University or elsewhere, or any collateral courses?

A. Collateral with the electrical engineering course I took nearly all of the other courses in the mechanical engineering department.

Q. 8. Have you ever had any experience in electrical engineering since your said academic training?

A. Yes, sir.

Q. 9. When and where?

A. In consultation on different plants in different parts of the country. One that I remember right

now, is at Toppliff Rock Quarry plant of the American Smelting & Refining Company at Salt Lake City, Utah. Also, in the year 1908, for about six or seven months, from about March until August, I had charge of the Coalinga Light & Power Company at the city of Coalinga, California.

Q. 10. Have you done any other engineering work in any capacity at any other places or plants or installations than those mentioned, and, if so, when and where?

A. Yes, sir; during the spring and summer of 1906, and from about April to September, I was employed in the Bakersfield Power, Transit & Light Company power house, at the mouth of the Kern River Canyon, about 16 miles from Bakersfield, California, in the capacity of assistant, and later on on the switchboard of that company.

Q. 11. Do you know of any other name by which that plant went?

A. The only other name that I know of is the name of the company which installed the plant, which name was "The Power Development Company."

Q. 12. During the time you were employed at that plant in 1906 what territory was served by the output of the station?

Mr. Westall: Objected to on the ground that it has not been shown by his connection with the company that he is competent to testify as to the territory served.

Mr. Blakeslee: Just add on to the question "if you know."

A. The power generated there was transmitted to a sub-station at Bakersfield from which power was distributed to the city of Bakersfield and to pumping plants in the vicinity of Stockdale, which, I believe, is east of Bakersfield, and where considerable irrigating and pumping machinery was installed, and also to a flouring mill near Bakersfield where a synchronous motor was installed. These I have seen at different times while in and near the city of Bakersfield.

Q. 13. What kind of loads did you have on the circuit from that station during the time you were connected with it?

A. It had the lighting load of the city of Bakersfield, the street lights of the city of Bakersfield, the electric railway company was served through a rotary generator, the synchronous motor at the flouring mill and numerous irrigating pumps throughout the country, which, for the most part, were served through a no-voltage release switches.

Q. 14. Can you state briefly the nature of make-up of the installation at that Power Development Company plant during the time you were connected with it?

A. About a mile up the river water was taken out of the river and passed through the head gates into a tunnel through which it traveled to the forebay which was some four or five hundred feet from the power house. In this forebay the surplus water ran over a spillway and out over a waterfall back to the river. The remainder of the water passed through

baffle boards to the penstock down to the powerhouse. This pipe curved in its descent and passed along the side of the power house, and from it branches were taken off to the three water wheels. These branches passed through a gate-valve and then passed a butterfly valve to the nozzle-block inside of the wheel casing. Inside of the wheel casing also was a water wheel with the buckets cast integrally with the wheel. On this shaft and the end of the shaft was a fly-wheel arrangement with parts on it which had evidently been used for a governor at one time, but it was not in service when I was at the plant. They had arranged by placing fibre discs between the parts, bolting them together, to reduce this to a simple coupling. Beyond this was a rotating armature-type General Electric Company generator of, I believe, 16 poles. This generated alternating current at 500 volts pressure, which was led through a switchboard to the transformers where it was stepped up to 10,000 volts and passed through a high-tension switchboard to the lines. Between the three water-wheel and generator units were two other units consisting of a Pelton wheel—the other wheel I have forgotten the make of—which operated the excitors for exciting the generators for generating the current in the large generator.

Q. 15. Have you anything further to say as to the types or makes of the water-wheels at this plant at that time?

A. The water-wheels at this plant at that time were Knight wheels, made by a Mr. Knight of Sutter

County. At least that was on the name plates on the machines.

Q. 16. What if any type or kind of governing apparatus was employed at this plant at the time you were connected with it for regulating the action of the water-wheels?

A. There was no governing apparatus employed in this plant when I was there. The governing was altogether by manual operation.

Q. 17. And how was this manual operation in governing perfected?

A. Each generator had mounted on its base a Schaffer-Buttenberg tachometer which indicated the speed that the generators were running. When the speed accelerated the assistant would go to the hand wheels and close the water off slightly on the wheels until the system was brought back to the proper position. As the speed decreased the butterfly valves were opened slightly by means of the hand wheel. In case of a sudden load throw-off or let-up on the load, both parties, the assistant and the switchboard man, would run to the hand wheels and close down the generators. Or, in case of a short circuit on the line or sudden release on the load, a hydraulic apparatus was used which consisted of hydraulic valves on what we term a hydraulic board placed by the side of the electric switchboard. This board had five handles, one of which was a master handle which would close all three of the gate-valves through which the water passed to the large generators. Also, another handle was placed so as

to open the by-pass which consisted of a 12-inch pipe leading out of the side of the penstock at the side of the power house and pointing toward the river, this being a drain for the purpose of relieving a water-ram when the other valves were closed suddenly. The other three handles on the hydraulic board operated respectively the three gate-valves on the water-wheels.

Q. 18. You have mentioned a by-pass in your last answer. Was there any other by-pass than that you have mentioned in or a part of or operating in connection with this Power Development Company plant during the time you were connected with it?

A. No, sir.

Q. 19. I show you what purports to be a photograph and ask you if you know anything about it, whatsoever.

A. This is a photograph taken by Mr. A. G. Carpenter who was the foreman of the plant and who gave the same to me, and it has been in my possession ever since. He gave this to me while I was working at the Power Plant. It is a view of the interior of the powerhouse in question, showing the three generators. Beyond them, up high, is the high-tension switchboard, and above that are the choke coils and gaps of the lightning arrester, and beyond this are the insulators where the wires pass through the holes in the building to the exterior. On the other side, underneath the lights, is the electric switchboard. By the side of this are the handles on the hydraulic switchboard.

Q. 20. Are those the handles that you have referred to in your previous answer for regulating the supply of water to the wheels and as controlling the by-pass device you have mentioned?

A. Yes, sir.

Q. 21. Please mark on this photograph in ink each of said handles, designating the same with a letter, and state what the handle designated by each letter performs in that plant.

A. On looking at this photograph I remember another handle. This handle controlled a hydraulic cylinder part way up the penstock, and from there this cylinder operating by means of a wire cable a swinging gate in the forebay which regulated the height of the water in the forebay, this being kept at a certain height which was shown by a light and pointer on a gauge on the mountain outside of the forebay, which we could see through an old transit telescope just outside the power house. The handle marked "a" we call the master switch, and this controlled all three hydraulic gates leading to the water wheels. The handles "b", "c" and "d", controlled the individual gates of the separate wheels. The handle "e" controlled the by-pass gate outside the building. The other handle, which is not shown on the photograph and which is back of the handle "e", controlled the water level in the forebay.

Q. 22. You have referred to the employment of a man at this plant when you were there aside from the switchboard man, in connection with the manual

regulation of the water wheels. Why was it necessary to have this extra man?

A. Because when any trouble would hit the plant the switchboard man would have all he could attend to at the electric switchboard. Another man was required to take care of the hydraulic work of the station, and this was the assistant's job, to regulate the water at the call of the man on the switchboard.

Q. 23. What do you mean in your last answer by the words "trouble hitting the plant?"

A. When heavy changes of load, or a short-circuit on the line, or a broken wire in the transmission line, or anything other than a steady, continuous load occurred, we called that trouble.

Q. 24. What specific things occurred on the circuit supplied by this station causing such troubles?

A. The general conditions that a high-tension line is subject to. For instance, lightning conditions. Also, we would be troubled more or less with sand hill cranes flying across the wires causing a short-circuit which usually made a sharp pull-down on the plant for a short space of time, throwing one or two generators out of synchronism, and also broken insulators.

Q. 25. Are you able to state from your engineering experience what sort of fluctuations in load on an electrical circuit are caused by the electromagnetic operation of dredgers for excavation work? That is, dredges operated by electric motors energized by an electrical supply system.

A. Only from my observation of steam-operated dredgers.

Q. 26. Are you able to say how extensive the fluctuations in load are due to the operations of such dredges, irrespective of the character of the prime mover operating the dredge?

A. All I could say is that the load variations are extreme, from what my observation has been.

Q. 27. How would such extremes of load variation compare with the load variation you encountered on the circuit of the Power Development Company plant that you have told us about?

A. They would be somewhat similar to the load of a street car, although very much heavier in extent.

Q. 28. Have you ever visited a hydro-electric central station in which the water wheels were regulated or governed automatically in any manner?

A. Yes sir.

Q. 29. In the operation and control of such a central station, assuming that everything is running properly or normally or is in perfect repair, how many men are employed to supervise the operation thereof?

Mr. Westall: Objected to on the ground that the witness has not shown himself qualified to testify as to matters of opinion on such facts.

A. The plant I used to visit quite often when I was working for the Power, Transit & Light Company, was the Edison Electric Company's Plant No. 1 on the Kern River, just above the head gates of our

power plant. When this was finally placed in operation later on, I have been in the power house a considerable time when the boy at the switchboard operated the entire plant, having full control of the plant.

Q. 30. By Mr. Blakeslee: Why was no assistant or second man required at such plant?

A. On account of the governor action, and also because of the switches being electrically controlled, making their operation easy for the operator.

Q. 31. What were the relative sizes of the Power Development Company plant and this Edison plant, pertinent to output in kilowatts or horsepower?

A. The total capacity of the Power, Transit & Light Company's power house was supposed to be about 2100 horse-power, while that of the Edison Electric Company's plant was about 30,000 horse-power.

Mr. Westall: We move that the answer be stricken out as showing that the witness has no definite knowledge on the subject. His language is "it was supposed to be", showing clearly that this is true.

Q. 32: By Mr. Blakeslee: What is the source of your information as to these approximate horsepower outputs?

A. The rated capacity of a machine is shown on the stampings thereon.

Q. 33. Now, as to this extra man employed at the plant of the Power Development Company when you were there, how long a shift did he work?

A. Eight hours a day.

Q. 34. And how much of the time of the twenty-four hours was the plant operated?

A. Twenty-four hours.

Q. 35. How about the other 8-hour shifts?

A. There were three shifts of 8-hours each, making the twenty-four hours.

Q. 36. And a man for each of those shifts?

A. Yes; there was a switchboard man for each shift and an assistant for each shift.

Q. 37. Do you know what the assistants on those three shifts were paid each a day, or month?

Mr. Westall: Objected to as immaterial.

A. New men were paid \$60 a month and after they had been there for some time they were raised to \$65.

Q. 38. By Mr. Blakeslee: Did this cover their board and lodging or not.

A. No; the board was deducted from this amount in about \$22 a month.

Q. 39. So there was an expense at that plant at that time to the operating company of upward of \$180 to \$195 a month for the three extra men for the three daily shifts, which men assisted the switchboard man in regulating the speed of the water wheels. Is that correct?

Mr. Westall: I object to that as immaterial, and also on the ground that the witness has not been shown to be qualified to give the amounts of wages or amount of money expended in the maintenance of the plant.

Mr. Blakeslee: The questions call for the knowledge of the witness, and counsel may in cross-examination determine how certain his knowledge is, if he wishes.

Q. 40. You have referred in previous answer to certain means for coupling the generator and water-wheel carrying shafts or shaft portions of this Power Development Company plant while you were employed there. How many such coupling devices were there in that plant?

A. There were three coupling devices. However, I believe one of these is a plain flange coupling with a fly-wheel.

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21 at end of line add "together with the title of the court and cause and the date upon which said exhibit was offered"

inclusive, as "Complainant's Exhibit Wilson Photograph No. 1", and ask that the same be so marked.

(The said exhibit so offered in evidence is marked "Complainant's Exhibit Wilson Photograph No. 1").

Q. 41. By Mr. Blakeslee: During the time you were connected with this Power Development Company plant was there or was there not any relief opening within the power house from the penstock or the water feeder pipe from the penstock to the water wheel, whereby any portion of the water could be discharged therefrom and by-passed around the wheels or either of the wheels?

A. There was a short duct just below and to the rear of the butterfly valve which extended downward toward the floor, but all the time that I was at

the plant or have seen the plant before or since, this was covered by a flange or plain plate of cast iron and was never used.

Q. 42. Was there any valve of any kind at that point at the time you were with this plant to control the discharge at that point from the feeder pipe?

A. No, sir.

Q. 43. Exteriorally of this plant were there any penstock or feeder pipe adjuncts at the time you were there?

A. Yes, sir.

Q. 44. What was the nature of the same?

A. There was an air chamber or cylinder which was kept full of air. This chamber was about 3 feet in diameter by about 15 feet high, and was kept filled with air by means of two air pumps which were belted from generators Nos. 1 and 2, and which could be thrown into operation until the chamber was filled with air and then thrown out of operation.

Q. 45. And what was the function or purpose or office of this air chamber?

Mr. Westall: Objected to in that the witness has not been shown to be qualified to answer questions as to the function and purpose of different parts of the apparatus.

A. For the purpose of absorbing any surges in the water-column or water-hammer.

Q. 46. By Mr. Blakeslee: Now, you have referred to a certain relief valve or by-pass in the penstock outside of this power plant, and which was hand-operated by means of one of the levers letter-

ed by you in "Complainant's Exhibit Wilson Photograph No. 1." How was such relief or by-pass used, and for what purpose?

A. When it was desired to close the plant down quickly this lever was thrown first, which opened the hydraulic valve on the end of this pipe, allowing the water to flow from the penstock out through this pipe back into the river. Then the other three levers could be thrown, which would close the valves controlling the water leading to the water-wheels.

Q. 47. Why was it necessary first to operate this by-pass or relief valve manually in the penstock outside of the power house before moving the gates of the several wheels in a closing direction?

A. Because the gates when hydraulically operated would close off the water so fast that the water surge causes a pressure which might become dangerous and which could easily be relieved by opening this discharge pipe at the side of the power house.

Q. 48. Was there any automatic action in connection with the parts which could be operated by any of these levers "a" to "e", inclusive, and so marked in "Complainant's Exhibit Wilson Photograph No. 1"?

A. No, sir.

Q. 49. Did any damaging results or effects occur at this plant while you were there at the times mentioned, due to inertia effects in the penstock or pipe-line?

A. No, sir. The by-pass was always operated and would relieve the pressure, although when first

closing down the hand valves the water would jet forth with apparently more velocity than later on.

Q. 50. Jet forth at what points?

A. At the end of the small 12-inch outlet or by-pass, outside of the plant.

Q. 51. Do you refer now to the hand-controlled by-pass outside of the power house in the penstock that you have testified about before?

A. Yes, sir.

Q. 52. Was there any other relief valve controlled on the water line supplying water to the wheels of this plant than this manually controlled outside by-pass in the penstock?

A. No, sir.

Q. 53. In the control of that plant how were the attendants apprised as to the necessity for manually governing for the speed of the water-wheels, aside from the indications upon the tachometers you have referred to?

A. By the sing of the generators you could tell whether the plant was speeding up or slowing down.

Q. 54. Were you or were you not in communication with various points upon the circuit for the purpose of being informed of varying load conditions?

A. Yes, sir; we had telephone communications with the sub-station, which, in turn, was in communication with the flouring mill, and at the substation also was the rotary converter for handling the railroad, and when such loads were going to come on or start up the rotary converter in the morning at about 5:30, and start the flouring mill synchron-

ous motor, they would call us up so that we would be ready to handle it in case it made a bad "synchronous shot." That is, if they would throw the motors onto the line out of step and thus cause a bad pull-down on the line.

Q. 55. What do you mean in your last answer by "pull-down"?

A. A suddenly increased load causing a reduction in the voltage, and, usually, a reduction in the speed, if it lasted long enough, in the generator.

Q. 56. Now, had there been installed at this Power Development Company plant when you were there some automatic governor for regulating the speed of the wheels and of the flow of the water to the wheels, and for taking care of the inertia effects or counteracting the inertia effects or preventing inertia effects in the pipe-line, or some automatic apparatus of this sort of some type or other, such as you say was installed in the plant of the Edison Company further up the Creek, would or would not these precautions with respect to telephonic notification, tachometer notification, and extra assistant for manual operation of the several controlling levers, etc., have been required in order to keep the speed of the wheels constant during load variations upon the circuit?

Mr. Westall: Objected to as calling for matters of opinion which the witness has not been shown to be qualified to give.

A. No, sir. If some automatic apparatus of a similar type had been had and had been applied to

this plant it could have had the speed of the generators maintained constant with varying loads.

Q. 57. By Mr. Blakeslee: And how with respect to preventing dangerous inertia effects in the pipeline? Would or would not that also have been likewise taken care of?

Mr. Westall: The same objection.

A. Yes, sir; that would have been taken care of.

Q. 58. By Mr. Blakeslee: Now, in this Power Development Company plant during the time you were there, was there anything in place or operative in the nature of a governor for regulating the speed or maintaining constant speed of the water wheels or for preventing dangerous inertia effects in the pipe-line, other than the manually operated devices or features you have told us about?

A. No, sir.

Q. 59. I show you what purports to be another photograph and ask you if you know anything about it, and, if so, what.

A. This is another photograph from my collection, having been given to me by Mr. Carpenter who took the same and who was the foreman of the plant when I was an operator there. This view is one looking between the generators at the control mechanism and the water intake of one of the water-wheels. Also, an exciter generator in the central foreground, and just beyond it with a lifting eye on top, is the water-wheel operating it. To the side of it is the gate-valve controlling the water to the exciter water-wheel, and the pipe leading from the penstock to supply it with water.

Q. 60. What plant does this photograph pertain to?

A. This is in the power house of the Power, Transit & Light Company, to which I have previously referred.

Q. 61. When was this photograph, and when, also, was the photograph "Wilson Photograph No. 1" taken?

A. The photograph "Complainant's Exhibit Wilson Photograph No. 1" was taken while I was at the power house in the summer of 1906. The photograph I here have is one taken some time before that as some of the apparatus shown in the photograph was not on the machinery when I was there.

Q. 62. Does this photograph show the gate you have previously referred to, or valve, controlling the supply of water through the feeder pipe to the wheel in its casing under manual control?

A. Yes. sir.

Q. 63. Where is that valve shown? Please mark the same with the small letter "f".

A. (The witness does as requested.) The manually operated valve is controlled by a wheel marked "f". This wheel operates a valve inside of the casing marked "g" by means of a worm and gear shown at "h". The hydraulic valve operated from the hydraulic board is marked "i", and is controlled by the hydraulic cylinder "j"; and, in order to relieve the pressure upon this valve in opening it, there is a by-pass valve marked "k" which could be opened, relieving the pressure from the big gate-valve so that it could be moved.

Q. 64. Where did that by-pass lead to?

A. It led from one side of the hydraulically operated valve around to the other side.

Q. 65. How were these valves and each of them primarily operated?

A. The valve shown in the casing "g" was manually operated by means of the wheel "f". The by-pass valve "k" was manually operated by means of the wheel "l", and the valve in the casing "i" was operated by the hydraulic cylinder "g" which, in turn, was manually operated by the handle of the hydraulic board marked "b".

Q. 66. Which of these valves is the butterfly valve you have referred to previously?

A. The valve in the casing "g", which is controlled by the worm and gear and hand wheel "f".

Q. 67. Why was a butterfly valve provided at this point?

A. It was more easy to control it than to move any gate-valve.

Q. 68. For what reason?

A. Because the water pressure action is balanced on the valve, while with a gate-valve the water pressure causes it to press against its seat, making it difficult to move.

Q. 69. I show to you "Defendant's Exhibit XX", and ask you if you find therein anything analogous to any of the features of installation at this Power Development Company's plant which were there when you were there?

A. No, sir; there was nothing at the plant like this when I was at the plant during the years 1905, 1906 and 1907, and while I worked there in 1906.

Q. 70. I show you now "Defendant's Exhibit ZZ", and ask you if you recognize in the showing thereof

anything analagous to what was present at the same plant at any time while you were there?

A. This represents a fly-wheel governor of a type similar to that at the power house, which, however, was not in use, and only a few parts were still in place on the fly-wheel; and, secondly, I could not identify exactly whether this was the same kind of governor or not.

Q. 71. Was there any kind of complete governor at this plant when you were there?

A. No, sir.

Q. 72. Where were these parts installed in that plant at the time you were there?

A. On the fly-wheels which join the water-wheel shaft to the generator shaft in generators Nos. 1 and 2. I don't remember whether there was anything at all on the fly-wheel of generator No. 3 or not, but I believe not.

Q. 73. In what sort of relation were the water-wheel shafts and generator shafts so joined in these units Nos. 1 and 2?

A. They were rigidly joined through fiber, to prevent making a joint through which electricity would pass, but a joint through which mechanical energy could be transmitted.

Q. 74. And was there or was there not any relative movements in the shafts through the rigid couples so established?

A. No, sir.

Q. 75. Were there any movable levers, weights or springs on these shaft-connecting parts when you were there or not?

A. There might have been levers, shafts or springs,

but, if so, they were fastened on so as to be immovable, because the apparatus was not in use at all.

Mr. Blakeslee: We offer in evidence the photograph last lettered by the witness, as "Complainant's Exhibit Wilson Photograph No. 2", and ask that the same be so marked.

(The said photograph so offered in evidence is marked "Complainant's Exhibit Wilson Photograph No. 2".)

Q. 76. By Mr. Blakeslee: I show you "Complainant's Exhibit Exterior of Power Development Company's Plant", and ask you if you recognize anything therein pertinent to any feature exterior to the plant that you have told us about in your previous testimony?

A. This is a photograph taken evidently quite a while before I saw the plant, but it shows the penstock coming down the side of the mountain, and also the air-chamber at the side of the building on top of the penstock, and also down near figures 324 is the cement tail-race where the water left the plant. The point where the wires left the plant on the end are also shown. The flume line shown in the picture was not there when I was there. The water at that time came down through a tunnel inside of the mountain.

Q. 77. You are now referring to what plant, in your last answer?

A. The Power, Transit & Light Company's plant, on the Kern River.

Q. 78. Which you have previously testified to?

A. Yes, sir.

Q. 79. I now show you five pencil carbon impression sketches and ask you to state briefly what each of same signifies to you, if anything, marking them in sequence

with capital letters of the alphabet, beginning with "A".

A. The print marked "A" is a diagrammatic sketch of a water-wheel nozzle arrangement, having two nozzle outlets each controlled by needle-valves worked in opposition by means of a lever arrangement, one of these applying on the water-wheel and the other passing below the buckets or vanes on the water-wheel.

The print "B" shows a nozzle arrangement consisting of a series of water-gates acting as nozzles through which the water passes against the ^{vanes} ~~valves~~ on the water-wheel; also a by-pass valve in a by-pass way so arranged that they are operated by a "single-lever-action controlling" means, so that as the water-gates are closed the by-pass valve is opened. The by-pass in this case is a
1626 8½ at end of line add "together with the title
of the court and cause and the date upon
which said exhibit was offered"

The print marked "D" shows a water-wheel and nozzle block arrangement with two nozzles, one applying on the wheel and the other passing below the wheel without striking the vanes, and a slide-plate with openings so arranged that when one nozzle is open the other is closed, and an operating rod for operating the valve-plate.

The print marked "E" shows a nozzle arrangement and water-wheel in which there are two nozzles, one applying on the water-wheel vanes and the other passing below the vanes without striking them, each nozzle being operated by a gate-valve operated through lever actions and control-rods by means of a governing cylinder and piston, the linkage so arranged that when one nozzle is open the other is closed.

Q. 80. Is it possible for you in any way to classify the types of valves shown in these five prints in any general way, or in any general classes, and, if so, please do so. That is, classify them with respect to the nature of action or the nature in which the cooperating features in opening and closing act.

A. The valves shown in prints "A", "B" and that applying on the wheel in "C", are valves in which the opening and closing is accomplished without sliding the valve parts, while that shown on the by-pass in "C" and gate in "D" and "E", the closure is accomplished by the parts sliding on seats to effect closure.

Q. 81. What, if any, pressures affect the parts sliding on seats last mentioned?

A. The water pressure causes the valve to be pressed against the seat.

Q. 82. And what is the effect so produced with respect to the valve apparatus?

A. It causes friction.

Q. 83. What is the effect of such friction in the valve operation?

A. It makes it hard to work.

Q. 84. How does that difficulty or opposition to valve action compare with the valve action pertinent to the valves shown in sketches "A" and "B" and applying to the wheel in "C"?

A. These valves shown in "A", "B", and applying to the wheel in "C", are more or less balanced as to water pressure—almost perfectly so when in partly open and closed positions.

Q. 85. And as between these two groups of valves is

there any preference to be stated with respect to the freedom of action and responsiveness to actuation?

A. Yes, sir; the balanced valve is usually used in a governing mechanism. For instance, the valves controlling the steam on a steam-engine is usually a double-seated valve, with the pressure operating above on one and below on the other, so as to balance the pressure.

Q. 86. And with respect to the sensitiveness and responsiveness of valve-action, what effects are produced in a sliding type of valve mounted within or under the pressure of the fluid controlled by the valve?

A. The more the valve becomes closed the greater the pressure causes it to press against the seat, and the greater the friction necessary to be overcome in moving it.

Q. 87. I show you "Defendant's Exhibit Berry Blueprint No. 1," and ask you to look at the valve marked "41", and also at the valve marked "48", and ask you further to state to which of the classes, if either, you have just designated, such valves or either of the same applies.

A. These are both cylindrical valves similar to that shown in the by-pass on print "C", and are likely to require considerable friction to be overcome in their opening or closing.

Q. 88. Have you ever previously testified in any suit involving the interpretation and infringement of U. S. Letters Patent?

A. Yes.

Q. 89. Can you mention the names or titles of any such suits?

A. Hardison vs. Payne, concerning an oil-well perfor-

ator; also in the Union Tool Company vs. the Wilson & Willard Manufacturing Company in reference to oil-well under-reamers; also in E. C. Wilson vs. Union Tool Company, also in reference to oil-well underreamers; also Willard & Willson vs. Union Tool Company, in reference to ~~the~~^a rotary well-drilling apparatus.

Q. 90. Do you remember where these suits were brought, and where they are pending—in what court?

A. In the Circuit or District Court of the United States, for the Southern District of California, Southern Division.

Mr. Blakeslee: We now offer in evidence the five sketches just considered in this deposition by the present witness, as “Complainant’s Exhibits Wilson Sketch A, Sketch B, Sketch C, Sketch D and Sketch E”, respectively, and ask the same to be so marked.

(The said sketches so offered in evidence are respectively marked “Complainant’s Exhibit Wilson Sketch A”, “Complainant’s Exhibit Wilson Sketch B”, “Complainant’s Exhibit Wilson Sketch C”, “Complainant’s Exhibit Wilson Sketch D”, and “Complainant’s Exhibit Wilson Sketch E.”)

Mr. Blakeslee: This concludes the direct examination of this present witness unless, of course, he should be recalled, and counsel for defendant may have opportunity to cross-examine this witness upon returning to this city, as to be jointly arranged between him and counsel for complainant, all to the end that counsel for defendant shall have such opportunity within one week from the time of returning to the city from the trip upon which both counsel are now about to go for the further taking of proofs in this case.

Bakersfield, Calif., Feb. 18, 1915, A. M.

JAMES F. DEARTH, a witness produced on behalf of complainant, being first duly sworn according to law to testify the truth, the whole truth and nothing but the truth, testified in rebuttal as follows:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and occupation.

A. James F. Dearth; age, sixty-nine; place of residence, Southern Hotel, Bakersfield, California; occupation at present is carpenter and contractor.

Q. 2. How long have you been occupied in the business of carpenter and contractor?

A. Just recently; about five years, or between four
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cause and the date upon which said exhibit
was offered"

work in this part of the country what was your occupation?

A. I was superintendent of a hydro-electric plant.

Q. 4. At what place?

A. In Kern County, State of California.

Q. 5. Can you locate the part of the county a little more definitely?

A. Sixteen miles east from Bakersfield at a point known as Kern Canyon, on the Kern River.

Q. 6. That is the point at which we are taking this testimony today?

A. It is.

Q. 7. When did you commence your connection with this power plant as superintendent.

A. If I remember correctly, it was sometime in December, 1895. I can tell you to a day. I came out to this Canyon on the 24th day of December, 1895. I am not sure of the year, but I think I am right. I looked through the records this morning, and, as near as I can locate it, it was 1895 that we commenced working here.

Q. 8. What was on the property where the plant now stands at that time?

A. Nothing but rocks.

Q. 9. What was the name of the concern operating, controlling or owning that plant or that property or prospect at that time?

A. The Power Development Company of Bakersfield.

Q. 10. Can you mention the names of any other persons who were connected or associated with that company at that time, and what their offices were?

A. The manager was Carroll N. Beal.

Q. 11. Where did he reside?

A. At that time in Bakersfield.

Q. 12. Do you know where he resides now?

A. San Francisco, California.

Q. 13. Previous to connecting yourself with the Power Development Company had you had any experience in superintending power plants, or in any capacity, in connection with power plants?

A. No, sir.

Q. 14. How did you come to connect yourself with the Power Development Company at that time?

A. Through Mr. Beal.

Q. 15. Had you prior to that time been a contractor and carpenter?

A. Yes, sir.

Q. 16. What was the first work you did on the ground here when you came in 1895?

A. I constructed a bridge across the Kern River about half a mile below the present power house site.

Q. 17. Did you have anything to do with building the power plant?

A. I did.

Q. 18. To what extent?

A. I built the power house, cottages, and all the necessary buildings for the operation of the plant. And, furthermore, I built a flume conveying the water from the river to a point where it is discharged into the pipeline coming to the power house. The flume was over 9,000 feet long. It was a wooden flume on the side of the mountain.

Q. 19. How far from the site of the present plant was the intake point of that flume?

A. Approximately 9,000 feet.

Q. 20. Did you at that time, or have you since, explored the Kern River Canyon to any extent above that intake?

A. Not very closely. I have been up several times.

Q. 21. How far?

A. Democrat Springs and Borel Springs.

Q. 22. How far is that?

A. The intake of the Edison plant is 9 miles above the power house and 2 miles above this power house, which makes it 11 miles from this power house.

Q. 23. Was this power plant or any other power plant

in the Kern River Canyon, or supplied by the Kern River, upstream from the present plant at the time you first came here?

A. No, sir.

Q. 24. What is the general formation of the country and slopes of the country or canyon from the point of the Power Development Company plant up to the 11-mile point to which you have explored it?

A. It is like it is here; a very deep canyon with high mountains on each side and all rocks.

Q. 25. Is there any vegetation on the slopes, or has there been at any time?

A. Very little. Some places there would be a few scrub trees growing, or something of that kind.

Q. 26. How large in diameter were the stalks of these trees?

A. The largest would not be more than 6 or 7 inches through.

Q. 27. How long were you connected with this plant?

A. About fourteen years, I think. Fourteen or fifteen.

Q. 28. During that time were you ever troubled with floating debris or twigs or sticks or broken-down vegetation coming into the flume or penstock?

A. Yes, sir.

Q. 29. To what extent and in what manner?

A. To the extent of closing the pipe down at several different times, choking up the grizzly. The grizzly, you understand, is bars to strain this stuff out. So that we had to shut down.

Q. 30. That grizzly was between the flume and the penstock?

A. There was one at the intake of the flume, a coarse one, taking out the coarser material; and then there was another one at the forebay of a finer screen.

Q. 31. What were the meshes?

A. The one at the forebay, if I remember right, was about $3/4$ of an inch. The one above was about $2-1/2$ inches.

Q. 32. How effectually did these grizzleys screen the penstock?

A. Well, we had no trouble with the water after it passed the grizzley, with this exception: There was a large amount of sand running in the flood waters.

Q. 33. Have you ever taken steps to ascertain the nature of the water in those mountain canyons supplying hydro-electric power plants, as to the content of ~~that~~ sand? Or do you know anything about that?

A. No, sir.

Q. 34. Do you know whether or not this Kern River varies from other streams in that particular?

A. Only by hearsay.

Q. 35. Was the normal condition of the water at this plant to have a considerable content of sand?

A. Only during flood waters.

Q. 36. How long a period during the year?

A. It would be intermittent. We might have a rise of two or three or four or five days, and then the water would clear again.

Q. 37. What time in the year?

A. Generally in the winter, from November until some time in March.

Q. 38. Did you ever have any such conditions in the summer time?

A. Once in a great while, due to the heavy showers above. It happened twice, I think, to my recollection.

Q. 39. Do you remember anything about this with respect to the first two years of the Power Development Company plant here, as to whether there was any sand in the water in the summer?

A. We never were bothered with that only in some of our installations at the power house.

Q. 40. Do you remember the years 1897 and 1898 whether you had any serious sand troubles with the water in the summer time?

A. I do not recollect that we did. In fact I know we did not, because they were exceptionally dry years and there were no flood waters that occurred. That was in 1897 and 1898 that you were inquiring about?

Q. 41. Yes. Briefly, what was done as to further construction or installation of this Power-Development Company plant after the building was completed?

A. Machinery was installed in the power house and the pipe-line connecting the forebay to the power house, and the pole line constructed to Bakersfield.

Q. 42. What times were these various steps taken?

A. I think installation work was commenced here in 1895, late in the fall when I commenced, and the following summer we built the flume. The machinery arrived sometime early in the fall. We took the power house and put in the foundation and received the machinery, and during that winter we installed the generators and the water wheels, running over a period of perhaps five or six months. We were fully six months before we had them completely installed. And at the same time this

pipe-line was installed up on the hill. That was done by a contractor in Los Angeles.

Q. 43. About when were the first water-wheels installed?

A. The work was going on there in the latter part of that winter. That would be the winter of 1897. We came in 1895. We were working on construction work in 1896, and I don't think the wheels were put in place until 1897, in the latter part of that winter or early part of that year.

Q. 44. Was that in 1897 that the wheels were ready for their first trial?

A. They were ready for their first trial sometime in June in that year.

Q. 45. What type of wheels were those?

A. They were called Girard wheels.

Q. 46. Do you know who furnished them?

A. They were furnished—I think the name of the firm was the California Electric Company, but I am not positive. B. C. Van Emon was president and was here in charge of the construction work.

Q. 47. Did you ever hear mentioned in connection with those wheels the name of the Girard Water Wheel Company?

A. Well, it was called the Girard water wheel. I do not understand that they were manufactured by any company of that name. It was called the Girard wheel.

Q. 48. What generators were installed in connection with these Girard wheels?

A. The General Electric.

Q. 49. How many of these wheels and how many generators were installed first?

A. Two of them.

Q. 51. ~~And two wheels?~~ *Two of each?*

A. No; two units, two generators.

Q. 50. ~~Two of each?~~ *And two wheels?*

A. Well, there were two wheels in each unit. The two wheels and the generator comprised a unit.

Q. 52. Two units each of two wheels?

A. Yes, sir.

Q. 53. And each unit was coupled up with a generator?

A. Yes, sir; coupled direct.

Q. 54. In what manner were the wheels coupled up with the generator in each instance?

A. Well, if you will follow me closely, I can give you an idea, pretty near. On the end of the generator shaft, which is 8 inches in diameter, is a heavy cast flange. The fly-wheel that is suspended between the generator and the water-wheel case has a similar flange cast to it. The fly-wheel is bolted direct to the end of the generator shaft through the medium of these flanges. An insulating washer of fiber was inserted between the flanges when they were bolted together.

Q. 55. The water-wheel shaft entered the fly-wheel proper up to the generator shaft?

A. The generator shafts and the fly-wheel shaft met about at the point where these two flanges meet. Do you get the idea? Where the two flanges bolted together, the water-wheel shaft came in, and the other was keyed solid to the generator shaft, and the fly-wheel was bolted to it, and then the opening was left there and the water-wheel shaft and 6-in. shaft would not close up to the end of that shaft, and this was connected to the fly-

wheels through a system of levers or what Mr. Cobb termed a dynamometer, which had the effect of weighing the load which was transmitted from the water-wheel to the generator. This was done through a system of levers, weights and springs. That is the way they were connected together. I think that answers the question, does it not?

Q. 56. You have mentioned Mr. Cobb in your last answer. Who was he?

A. Edwin S. Cobb. He was our supervising engineer. I will change that. He was a hydraulic engineer.

Q. 57. Was one of these dynamometers provided for each of the two units that you have spoken of?

A. One was made in each fly-wheel.

Q. 58. Were those two units or either of them provided with any means for governing the speed of the water-wheel?

A. Yes, sir.

Q. 59. What was the general nature of such means?

A. I want to get that clear, if I can. I know it from start to finish—every bolt and screw about it. The dynamometer which was mentioned was connected through a sliding sleeve on the water-wheel shaft to a bell-crank connecting with a system of bell-cranks and connecting with a hydraulic engine, and connecting with the by-pass and throttle valves, as you might term them, or whatever you do term them, that were located in the nozzle blocks. Have I got that straight?

Q. 60. We can't tell you. You are testifying.

A. I am going right through from the fly-wheel to the mechanism which by-passed the water and controlled

the water on the wheels. You have got it straight as it goes.

Q. 61. How did this dynamometer act in connection with such so-called by-pass?

A. At no load, running at normal speed, which was 257 revolutions per minute, the equalizing levers in the dynamometer were terraced—closed. As the load increased the centrifugal pull spread the levers actuating this sliding sleeve through the medium of the bell-cranks operating on the hydraulic engine. That in turn operated on the by-pass, and the valves in the nozzle blocks.

Q. 62. And when the valves in the nozzle block were operated on what effect was produced?

A. They opened and closed as the occasion demanded. As the load increased, the effect on the hydraulic engine was to open the nozzle block and close the by-pass, thus increasing the power on the wheel as demanded.

Q. 63. Were the shafts on the generator and on the water-wheel in each unit connected in any way other than by this dynamometer?

A. They were not.

Q. 64. Then it was possible for a change in speed of the water-wheel to take place at the same time a change in load took place upon the generator?

A. A change in the load on the generator would either speed the wheels by closing them down, invariably, without any device whatever to remedy that. That is the result. The more load the less speed, or the less load the more speed, without any intervening device.

Q. 65. Were there any other fly-wheel devices on these shafts?

A. No, sir.

Q. 66. Was there any other governor device used in connection with these Girard wheels and the generators connected with them? That is other than this dynamometer?

A. No, sir. Yes, there was; there was, independent of the dynamometer.

Q. 67. What was that?

A. By manipulating the operation of that ram by hand.

Q. 68. What ran was that?

A. The hydraulic engine. We call it a ram or engine.

Q. 69. What did it have so as to be controlled by hand?

A. It had a little hand-wheel on a sliding sleeve that you could move and change the position of the balanced valve so as to admit more water to the ram—admit the water at one end of the ram for opening of the valves and on the other for closing the valves.

Q. 70. Was it ever so used by you? That is, by controlling it by hand?

A. A great many times.

Q. 71. Why was it necessary that this hand-control was provided?

A. The mechanical control contained in the fly-wheel did not meet the requirements.

Q. 72. And what effect did that have upon governing the water-wheel?

A. It gave too wide a range of speed.

Q. 73. And what was the effect of this too wide range of speed?

A. An increased voltage, or a decreased voltage and

slowing down of the motors connected on the plant, or speeding them up.

Q. 74. What result would that have upon proper governing?

A. I don't quite get that question.

Q. 75. What would be the effect of that with relation to proper governing?

A. Proper governing should give you uniform voltage and speed, to get the ~~best~~ ^{best} results and give the best satisfaction to your customers.

Q. 76. Did you have any complaints as to variations of voltage on the circuit of this plant when the dynamometers were relied upon?

A. We certainly did.

Q. 77. And after receiving such complaint was the dynamometer relied upon to automatically attempt the governing?

A. Not fully; no. We kept a man on watch all the time.

Q. 78. What did such man watch?

A. The speed fluctuations.

Q. 79. And when he found extensive fluctuation what did he do?

A. You understand that the line was new. The installation was new all through, and we were subject to severe shocks due to the line coming down and the lines coming together—what we call a short. That would slow your speed right down because it would put a very excessive load on your machine. The governor would not take care of it at all. It was a question of shutting down the plant when it came to be severe. If it was not so severe the second man in the power house, who was al-

ways where he could reach this hydraulic engine, would take hold of that little hand-wheel and slide that a little one way or the other and make the hydraulic engine shut off or put on the water as the occasion demanded.

Q. 80. How much of the time that these dynamometers were used on the Girard wheels was it the custom to so control or govern the wheels by hand in the manner you have stated?

A. We attempted at first—You understand the load we had here first was what was termed a “non-inductive load”, and was constant. It was incandescent lights, the nicest and easiest load in the world to handle. From local disturbances on the line we did not have any trouble. That is a load that builds up very slow, and with a little assistance, and they always had to have a little assistance on that governor, when the load increased to change the location of this valve that I speak of. I operated alone in there for two or three months at nights, and I would have to slip around there and change that valve occasionally as our load increased. The governor would not adjust it to the right point. There would be a fluctuation. Then, as the load decreased, I would have to reverse the operation. When we began to get motors on the line, when they threw them in, it made a little shock on the line, and it would put on all the way from 10 to 50 horse-power on your line. I had to put the second man in the power house so as to be convenient at all times to handle the hydraulic engine. That is when we were operating with the Girard wheel. We never had any other control on that wheel only through this hydraulic engine, you understand. No butterfly valve. Then, when there was a severe shock came on

the line, the only remedy we had was to shut the plant down—we couldn't do a thing with it—and then start up again.

Q. 81. What was your experience with this so-called by-pass valve and the means you have referred to for operating it in connection with the dynamometer?

A. I don't know hardly how to express my contempt for that. It bothered me nights and Sundays. It never worked satisfactorily for twenty-four hours in succession. The construction of it was against it absolutely.

Q. 82. Can you mention some of the troubles you had with it?

A. The fine silt and sand in the water which the water carries to some extent all the time.

Q. 83. What did that cause?

A. That was a brass cylinder revolving inside of another cylinder, fitting very close. It is exactly the same proposition as what we call a water-service cock. The fine silt and sand worked its way in between the two surfaces and would stick and twist off your bell-cranks and away they would go.

Q. 84. How many different times did such twist and breaks occur, if you recollect?

A. I can't tell you. It broke before we ever started the plant and put it on the line.

Q. 85. What was it necessary to do then?

A. Shut it off and run without it.

Q. 86. How long a duration of time did you run this plant without that by-pass?

A. We would run it—sometimes we had to send to the city to get necessary repairs, and, in any event, we had to take it clear out and clean it up, and it would shut

us off from the by-pass perhaps from five hours to five or six days.

Q. 87. How long was that by-pass device in attempted use? That is, how long did you try to operate it with the rest of the governing system?

A. My recollection is we abandoned that entirely about two months after—I don't think we worked with it over two months' time. We gave it up as a hopeless case.

Q. 88. What was that by-pass device installed for?

A. To protect the pipe-line from unusual pressure, or what is called a ram or shock. For instance, if this governing device had worked out as it was designed and expected to work, and a heavy shock came in on the line, it blowed the fuse. But when we were running at full load, and the load was taken off, the speed would jump from 257 up to the maximum, which is 500, and do it very quick. This governing device would shut the water right off immediately, and in doing so, unless there was some relief to the pipe-line, it would produce a hammer at some point and perhaps split it open. It was for the protection of the pipe-line.

Q. 89. Was there anything else provided in connection with the plant at the time the Girard apparatus was attempted to be used for the purpose of protecting the penstock or pipe-line?

A. There was an air-chamber installed on the pipe-line when it was constructed for that purpose. That was kept full of air all the time so that in case of a shock it compressed the air and relieved the strain.

Q. 90. What was the occasion for that air receiver?

A. To some extent it was a great help.

Q. 91. How did it work in so helping?

A. It would relieve the pressure by compressing the air and giving more space to the volume of water.

Q. 92. Was any attempt made to operate this by-pass device by any other fluid than water taken from the penstock?

A. Yes, sir.

Q. 93. What was attempted to be used in place of the water?

A. No attempt was made to operate that in any other way except its connection with this hydraulic engine. We made several experiments with the hydraulic engine.

Q. 94. What was the nature of the experiment?

A. We used the water first from the pipe-line, and a provision was made to strain out what they assumed to be the coarse sand that would make the trouble, with a strainer in the pipe before the water reached the engine in this work. Then that failed almost immediately. Mr. Van Emon was here at the time, and gave it up. Then the next thing, we installed a 30-gallon tank at the power house and filled it with light oil and put that under pressure from the pipe-line and operated the hydraulic engine with the oil. That did not work satisfactorily. The next thing we done we installed a 500-gallon steel tank and connected it up with a spring we have for domestic purposes and which is pure clear water and no sediment whatsoever in it. On all the operations we ever had with the hydraulic engine afterwards, it was operated with that water. The water gave no trouble after that.

Q. 95. Was the by-pass attempted to be operated

with this spring water as the fluid for the hydraulic engine?

A. It was.

Q. 96. Did you get any better results?

A. Not that we could notice; not with the by-pass.

Q. 97. What kind of repair work did you have to do with respect to this attempted by-pass device when you found that it was giving trouble?

A. Whenever that balked on us, the engine had sufficient strength to break the bell-crank connections connecting it with the engine, and invariably the casting broke. Then we knew the cylinder was stuck in there, and then it was a question of taking it out and getting that cylinder out and cleaning it up and getting new castings and putting them back.

Q. 98. How soon after new bell-cranks or levers were put in the place of the broken ones did you have further breakage of that same thing?

A. I can't tell you that. We got them frequently. My recollection is that we ordered a duplicate set so as to be prepared for it.

Q. 99. How early, approximately, did you have a further break after you had repaired the parts which had been previously broken?

A. It might last ten days or two weeks. I don't think any of them exceeded two weeks before we would have to take it out. Sometimes we would see it would work sluggish, and we would disconnect it and take it out and clean it and avoid a breakage.

Q. 100. And was this a part of the general operation of the plant,—attending to the by-pass?

A. That was part of our work, to keep it going.

Q. 101. You have stated that you attempted to use this by-pass about two months.

A. As near as I can remember.

Q. 102. What was done at the end of these two months with this by-pass?

A. Disconnected it entirely.

Q. 103. What was done with it?

A. It was taken out and junked.

Q. 104. Was any other by-pass device to take the place of it?

A. No, sir; not with the Girard water-wheel.

Q. 105. Was there ever any by-pass device put in place of it to be operated by a governor?

A. Oh, yes. On the Knight wheel.

Q. 106. What became of that by-pass?

A. We installed two of them. They are now in place. We abandoned them and sealed them up, and they stand there.

Q. 107. Why did you abandon them?

A. They wouldn't work at all.

Q. 108. What governor was used in attempting to operate them?

A. The same that we used with the Girard, only a little different, to meet the conditions.

Q. 109. The dynamometer, do you mean?

A. Yes, sir.

Q. 110. How long were these second by-passes attempted to be used?

A. My recollection is about ten or fifteen minutes. Not over that.

Q. 111. When you attempted to operate this first

by-pass, or these first by-passes by hand, what results did you get?

A. The by-pass would operate all right so long as it was working free. Whenever the engine worked it worked simultaneously with the engine. The engine worked that and the valves controlling the wheels at the same time when the by-pass was free.

Q. 112. But it was necessary to control it by hand at such time?

A. No; not necessarily. When it was free it would work just as well as the valves would in the nozzle blocks.

Q. 113. Did you have any trouble in working with the nozzle blocks?

A. Oh yes. We certainly did.

Q. 114. How long altogether do you suppose the attempted by-passes were actually in use in connection with the Girard wheel?

A. I don't think the by-pass was used to exceed two months. Understand, after we put the plant in condition we ran here for probably two or three weeks an hour or two at a time by way of testing out, but after we got it going so that we were giving service I don't think it was exceeding two months that we could use the by-pass.

Q. 115. How much of that time do you think it worked, one way or the other?

A. Probably one-third of that time.

Q. 116. If you were to install or assist in installing a hydro-electric power plant at the present time, would you advocate or permit the installation of a by-pass of such kind first used by the Girard water wheel?

A. No, sir.

Q. 117. For what reason?

A. Because it was inefficient and was not equal to doing the work.

Q. 118. Did it or did it not not accomplish the work it was expected to accomplish?

A. It did not.

Q. 119. How did the generators operate when driven by the Girard wheels, with respect to efficiency?

A. The best efficiency of a generator is its normal load. We never could deliver to exceed if my recollection serves me right, about 40 per cent, or, possibly 50 per cent, of the real load of the machine.

Q. 120. What do you lay that to?

A. Inefficiency of the water-wheel. It could not deliver the goods.

Q. 121. You mean 40 per cent efficiency from one of the wheels?

A. Well, give it the advantage of all there is and say 50 per cent.

Q. 122. From one of the wheels?

A. From one of the wheels. My recollection is that it was less than that. I know it was a very great disappointment.

Q. 123. As to these various connections between this scrapped or junked attempted by-pass device installed with the Girard wheels, and the dynamometer, what became of them?

A. We scrapped the whole bunch and sent them to the Bakersfield Iron Works for junk.

Q. 124. Do you know whether any of them are in existence today?

A. Some small pieces.

Q. 125. Where are they?

A. At the power house in Kern Canyon.

Q. 126. When did you last see them?

A. Today.

Q. 127. Do you know what was done with them today?

A. They were laid out on the pipe-line and photographed.

Q. 128. And was anybody photographed with them?

A. Yes, sir.

Q. 129. Who?

A. Myself.

Q. 130. Who took the photograph?

A. Mr. Henry.

Q. 131. The complainant in this case?

A. Yes, sir.

Q. 132. I show you two prints respectively marked "Defendant's Exhibit XX" and "Defendant's Exhibit ZZ", and ask you if they suggest anything to you, or mean anything to you, from your experience or knowledge?

A. They look perfectly natural.

Q. 133. In what respect do they look natural?

A. They show the water-wheel. They show the connections on the outside of the water-wheel case with the nozzle blocks inside, controlling the water-wheel. They show the hydraulic engine and its connection with the by-pass. They show the fly-wheel with the assembly in the fly-wheel which actuates the hydraulic engine controlling the water-wheels.

Q. 134. What apparatus have you been referring to in reciting these various parts?

A. The apparatus that controlled the Girard water-wheel.

Q. 135. At what plant?

A. At the Power Development Company's plant in Kern County, State of California, at Kern Canyon.

Q. 136. Any connection between that and the one that you have previously been telling us about?

A. The same one.

Q. 137. Does either of these cuts or do both of these cuts show any of the parts which you have said were photographed today with yourself in the picture, or any parts like that, which were provided for use at that plant?

A. Yes.

Q. 138. Will you please now step to the location of those parts and point out the identity of those several parts with the several parts lettered on these two prints which are last shown you? In this connection I will state that these parts which were photographed have adjacent to them certain numbers. Were those numbers there when the photographs you have mentioned were taken?

A. They were.

Q. 139. Please, then, connect up the numbers of those parts that were photographed with the letters around these cuts.

A. I mark on "Exhibit ZZ" with the figure 1 the part before us; 2 is the same sort of a part; 3 runs right through these parts assembled in the fly-wheel, it don't show it here—yes, it does, right in there. I mark part 3

also on "Exhibit ZZ." The part 4 is the part marked "I". The part 5 is a duplicate of 4. 6 is this piece right here marked "V". The part 7 is a weight right in here that slides on those bars. I will mark it on this exhibit—it is not visible here. They are weights sliding on the bar to balance the wheels. The figure 8 is not visible here; it is on the other side of the machine. Figure 9 a connection of the hydraulic engine, and is not shown here. 10 is not shown.

Q. 140. Are any of these parts before us which are numbered broken at this time, and, if so, which?

A. Yes, sir.

Q. 141. Give the numbers.

A. Number 5 is broken, number 6, number 8 and number 9.

Q. 142. Do you know what was done with any of the junked parts of this attempted Girard water-wheel governing apparatus that is now on the premises here today?

A. Yes.

Q. 143. What was done with it?

A. The cast-iron was delivered to the Bakersfield Iron Works and sold for junk. The bronze metal was sold to the Kern County Land Company for use in their shops.

Q. 144. How long were the Girard water-wheels used.

A. I couldn't tell you certainly about that. It was in commission till we got the other installed.

Q. 145. What wheels were installed next?

A. You recollect we only had one Girard water-wheel

installed. The next one was a Tuthill, manufactured by the Oakland Iron Works.

Q. 146. About when was that installed?

A. That was installed—these were started up in 1897, and the following winter, whether it was in 1898 or late in 1897, but I think it was in 1898, the first Tuthill wheel was put in. We only had two units then.

Q. 147. What did you do with the Girard Water-Wheel when it was thrown out?

A. Smashed it to pieces and hauled it away for junk.

Q. 148. How long were you continuously superintendent of the power plant of the Power Development Company?

A. My recollection is about fourteen years.

Q. 149. When did you sever your connection with the company operating it?

A. I couldn't give you the exact date. I could get it for you, because I resigned from this company just one month before the San Joaquin Light & Power Company took hold of it, and just when that was I haven't got any data. I may have it in my desk at home.

Q. 150. Approximately what year was it?

A. That would be five years ago.

Q. 151. How many Tuthill water-wheels were placed in this plant?

A. Two.

Q. 152. That is, two units?

A. Two units; yes, sir.

Q. 153. How many wheels in each unit?

A. Two wheels.

Q. 154. What was used for governing the flow of water to these Tuthill wheels?

A. The same device up to the hydraulic engine; beyond that there was a different device on the water-wheel.

Q. 155. What was the nature of that device?

A. It was in the nature of a baffle-plate shut over the nozzle.

Q. 156. How were those baffle-plates operated?

A. By this hydraulic engine.

Q. 157. Were they at any time hand operated?

A. Oh, yes.

Q. 158. Was any by-pass or relief device used on the pipe-line in connection with these Tuthill wheels?

A. No; it was not necessary.

Q. 159. Why?

A. The water was not shut off in any sense of the word, but just deflected from the wheel.

Q. 160. In other words, if I am correct, the flow of water to the wheels was not changed in volume?

A. Not at all.

Q. 161. What was done with the openings on the pipe-line at which the attempted by-passes were installed for the use of the Girard wheel?

A. They were closed up by iron plates put over them.

Q. 162. Were they ever opened up again?

A. No, sir; not until the Knight wheel was put in.

Q. How long were the Tuthill wheels used?

A. Approximately the same length of time, till we could install Knight wheels.

Q. 164. How many other wheels were put in?

A. Two, at that time.

Q. 165. During the latter part of the operation of the deflectors on the Tuthill water-wheels, how were they operated?

A. They were controlled the same as they were on the Girard, by this movable sleeve.

Q. 166. How much of the time were they operated by hand?

A. Well, nearly all the time. Fully half of the time. The man had to be right there to watch it all the time.

Q. 167. How long was the air reservoir kept on the pipe-line?

A. It was there all the time.

Q. 168. Is it there today?

A. Yes, sir.

Q. 169. Was any other photograph taken by Mr. Henry today in which you formed a part of the picture?

A. Yes, sir.

Q. 170. Where were you positioned at that time?

A. In the power house.

Q. 171. Near what part of the plant?

A. Standing by the desk in the power house.

Q. 172. Any other picture taken with you in it today?

A. Yes, sir.

Q. 173. Where were you stationed then?

A. Sitting by the water-wheel case in the power house.

Q. 174. Who furnished these Knight water-wheels?

A. Mr. Knight of Sutter Creek, California.

Q. 175. What sort of a controlling apparatus was put in with the Knight wheels?

A. A butterfly valve was installed in the pipe-line before the pipe entered the water-wheel gate.

Q. 176. What was that butterfly like?

A. Like the damper of an ordinary stove-pipe.

Q. 177. How does that kind of a valve differ from the service-cock shape form of valve that you have described in speaking of an attempted by-pass device on the Girard wheel installation?

A. Well, the construction of a butterfly is an iron disc inside of the pipe-line, in a chamber that is prepared for it. That will close tight when it is set nearly vertically across the pipe-line. And, as you open it, it lets the water pass through. Opening it to approximately 90 degrees, it leaves it standing the other way, which gives a free passage for all the water in the pipe-line.

Q. 178. When it is opening and closing does the presence of sand that might be in the water have anything to do with the smoothness or ease of its action?

A. Not a bit.

Q. 179. Why?

A. The water has a free passage right through. The sand does not cut any figure with a butterfly valve.

Q. 180. In using the service-cock shape form of valve like the by-pass you referred to, what is the effect of the pressure of water on the valve when it is being turned?

A. The water has an effect to force itself in between the service-cock and the chamber it revolves in.

Q. 181. Are these surfaces in contact when the valve is moving?

A. Yes, sir.

Q. 182. One slides on the other?

A. One revolves inside of the other.

Q. 183. Are any such surfaces in contact in using the butterfly type of valve?

A. There is none.

Q. 184. Do you know who advised putting the air receiver on the pipe-line when the Girard wheels were installed in the plant?

A. That was part of the installation and designed by our hydraulic engineer, Edwin S. Cobb.

Q. 185. And for what purpose?

A. For the purpose of relieving the pipe-line of undue shock.

Q. 186. Supposing this air-chamber had not been provided; what would have been the effects of the water pressure in the penstock when you were operating the water-gates?

Mr. Westall: Objected to on the ground that this witness has not been qualified to testify as an expert in this case, and he is called upon to give matters of theoretical opinion, which his experience, as testified to, has not qualified him to give.

A. I know nothing about that, only from what I hear.

Q. 187. By Mr. Blakeslee: Did you ever have any sticks or twigs or the like come through the penstock and down to the water-gates in the plant?

A. We never were troubled with our water-gates. They are 20 inch gates on the pipe-line. We never were troubled with the gates.

Q. 188. That is, you never were troubled by reason of sticks or twigs tending to jam them?

A. Not at that point.

Q. 189. Where did any such trouble occur?

A. In the nozzle blocks of the excitors.

Q. 190. What were the sizes of the pipes of these gates?

A. Of the nozzle blocks we had two types in the exciters. One of them was a straight nozzle, and three Pelton wheels on one exciter, and their nozzles are 7-8 inches when they are new. They get bigger as they wear.

Q. 191. At any time when sticks or twigs caused any jamming ~~at~~ these points, did it produce any effects of pressure on the pipe-line?

A. No, sir.

Q. 192. What do you understand has been the purpose and function of the air receiver on this pipe-line?

A. To take care of the undue shocks to the line.

Q. 193. In other words, to produce elasticity or yield in the pipe-line?

Mr. Westall: Objected to as leading and suggestive.

A. Yes, sir.

Q. 194. By Mr. Blakeslee: What if any attempt to operate any by-pass device was there in connection with the Knight wheel?

A. Well, that is a long story.

Q. 195. Was it a pleasant story or a sad story?

A. It resulted in disaster.

Q. 196. What happened to produce such disaster?

A. It wouldn't work.

Q. 197. Were there any other disastrous effects?

A. Nothing; only we abandoned it.

Q. 198. How long was it attempted?

A. Ten or fifteen minutes, or possibly fifteen minutes told the whole story.

Q. 199. Are there any parts of such attempted by-pass on the plant today?

A. Two of them down there.

Q. 200. Are they in working condition?

A. No, sir.

Q. 201. What is their condition?

A. They are closed up and sealed.

Q. 202. How long have they been in that condition?

A. Well, since the installation of the Knight water-wheels. They were installed with the Knight wheels.

Q. 203. And it was immediately after that, or fifteen minutes after their attempted use, that they were abandoned and sealed up?

A. Yes, sir.

Q. 204. What, from your experience does the dynamometer you have told us about amount to as an attempted governor?

A. We never found it reliable.

Q. 205. Are any parts of those dynamometers in position in this plant today?

A. Yes.

Q. 206. What is their conditon? How many of them are there?

A. Three.

Q. 207. What is their condition?

A. They are tied up and not in use.

Q. 208. What is used today to connect the water-wheel shafts with the generator shafts?

A. It connects through the same mechanism. Tied up.

Q. 209. In what way are they tied up?

A. I don't know how they ~~are~~^{were} tied up. Mr. Easton told me they tied them up.

Q. 210. Did you look at them today.

A. I had no opportunity. I only testified to that as far as my own experience. When I was running the

plant we just disconnected the bell-crank system entirely and removed all of the parts excepting the assembling inside of the fly-wheel. We left that just as it was, and it operates there or did at the time I left the plant just the same as it did, as though it were governing the plant or attempting to.

Q. 211. Is it used in governing the plant today ?

A. No, sir.

Q. 212. Is it used in any capacity except a coupling?

A. It is only used as a coupling between the water-wheel and generator.

Q. 213. How about its being used as a fly-wheel?

A. The fly-wheel is still in position and in use.

Q. 214. What was used in attempting to operate these later by-pass devices put onto the Knight wheels?

A. The same hydraulic engine installed by the Girard people, but in a different place.

Q. 215. Now, at the present time, is anything else used in connection with this plant as auxiliary to the governing of it?

A. Hand government; A butterfly valve.

Q. 216. How many butterfly valves?

A. One in each unit.

Q. 217. Is anything else used in connection with this plant to regulate or check or control the flow of water to the wheel?

A. There ~~is~~ ^{was} not when I left the plant.

Q. 218. Is anything used in connection with this plant on the pipe-line or back of the pipe-line to regulate the flow of the water to the plant?

A. No, sir. The flow of water to the plant?

Q. 219. Yes.

A. There is a safety gate in the forebay to maintain a proper level there at all times. That controls the water in the forebay.

Q. 220. At what point is it controlled?

A. From the power house.

Q. 221. In what manner?

A. The hydraulic engine.

Q. 222. How do you know from the plant what the level is?

A. A water gauge on the forebay.

Q. 223. How far is that from the plant?

A. That is 625 feet, approximately.

Q. 224. How do you observe it from the power plant?

A. Through a glass—a telescope.

Q. 225. And why is it advantageous to have this gauge at the forebay?

A. An excess of water would cause an overflow that might injure the plant.

Q. 226. How with respect to the pipe-line?

A. It would not affect it at all unless it would be to wash it out.

Q. 227. Is that part of the management and supervision of the power plant, namely, to keep tab on this forebay gauge through the glass and to regulate the flow past it from the power house?

A. Oh, yes. The operator in the power house takes care of that.

Q. 228. What is the primary method of controlling the butterfly valve, one for each unit in the plant at present?

A. A worm gear and hand wheel.

Q. 229. Is anything else used in this connection?

A. No, sir;—well, the same system is carried out through a system of bevel gears.

Q. 230. Is any sort of relief provided in the pipe-line today?

A. Yes, sir.

Q. 231. What is the nature of it?

A. A 12-inch hydraulic engine. A 12-inch gate operated by a hydraulic engine on the outside of the power house.

Q. 232. What controls that engine?

A. It is controlled by a hand lever at the switch-board.

Q. 233. Are there any other gates up the pipe-line or back of the butterfly valve of the three units?

A. Yes, sir.

Q. 234. What are they for?

A. They are to shut down and stop the water.

Q. 235. How are they operated?

A. The hydraulic engine.

Q. 236. By means of what?

A. Water.

Q. 237. What sort of control?

A. Hand control, and a lever at the switchboard.

Q. 238. If I understand you correctly, there are three separate hand controls, one for each of these gates, one for the forebay gate and one for the relief gate of the hydraulic engine.

A. Yes, sir; that is right.

Q. 239. Then in addition to that there are the three

hand-operated butterfly valves in the three distinct wheel units? Is that correct?

A. Yes, sir.

Q. 240. How many controls are there for each of these butterfly valves?

A. One to each, a hand wheel.

Q. 241. Is there any other wheel for controlling each of these butterfly valves between the main hand wheel and the wheel case?

A. Yes.

Q. 242. How are they operated?

A. Operated with a hand wheel by shafts and bevel gears.

Q. 243. Then I think I can sum it up correctly, and if I don't please correct me, when I say that I gather from your testimony that there are five hand levers and three separate pairs of hand wheels used in the control of this plant for its three wheel units at the present time. Am I correct?

A. Yes. A pair to each unit, one at each machine at the water-wheel case itself, and the other on the aisle in front of the switchboard.

Q. 244. In addition to the five hand levers?

A. Yes, sir. They are the hydraulic control.

Q. 245. And is it possible to properly and safely control and operate this plant at the present time without giving due attention to the hand operation of each one of these controlling devices?

A. No, sir; it is not.

Q. 246. Have you ever seen a hydraulic plant in which there was an automatic governor installed for

controlling the supply of water to the wheel case and for controlling the relief valves in the pipe-line?

A. No, sir.

Q. 247. If an automatically operating governor, such as that in kind or character, or with the object in view such as that attempted to be installed and operated in connection with the Girard water-wheel, were successful in use and operation, would or would it not be necessary to have these several sets of hand levers and hand wheels for the control of the supply of water to the wheels, to regulate the speed of the same, and also to take care of the pipe-line and protect it by a relief valve, and to have a man constantly in charge of these various hand devices?

Mr. Westall: Objected to as calling for matters of opinion which the witness has not been qualified to give.

Mr. Blakeslee: It has been shown by this witness what the purpose of the Girard installation was, and this question is predicated upon the witness's shown knowledge of that desired purpose.

Mr. Westall: The question goes further than that. It asks for matters of engineering theory, as to whether or not an air-chamber is required under certain conditions, and it calls for expert opinion of a man who has not had educational training as an engineer, and which might be even subject to differences of opinion among men most skilled in the art.

Mr. Blakeslee: We have not referred in the question to air-chambers at all, and the witness has shown his familiarity with the operation of an air-chamber, so far as that goes. We ask merely for a statement of fact

by the witness, based upon his experience with the Girard apparatus.

Mr. Westall: I would further state that the witness has shown that he has had absolutely no experience with anything but manual governors, except the original Girard governor, and he is not, therefore, qualified to state how far any governing which might properly be called successful governing would dispense with hand governing.

A. Just pay particular attention to how I answer this question. If the governing device supplied with each unit here by the Girard Water Wheel Company had filled the guaranty which guaranteed to give us for the regulation of the speed and safety, to the pipe-line—had it fulfilled these requirements, all this other trash would have been absolutely useless to the power house. Now you have got it as straight as I can give it. It is a question of absolute experience. I was up-against-it, and I know.

Q. 248. By Mr. Blakeslee: In order to take care of the various hand devices controlling the water wheels of this plant, including the Girard, Knight and Tuthill, were the services of one man in the power plant sufficient?

A. If it is automatically governed one man is enough.

Q. 249. How many did you use?

A. Two, all the time.

Q. 250. How long did each of these men work a day?

A. Eight hours each.

Q. 251. How many of the twenty-four hours was the plant operated?

A. Full time, twenty-four hours. Three shifts of 8-hours each.

Q. 252. One man for each shift?

A. Two. Two men on duty all the time.

Q. 253. That is, one of these two men had as his duty to attend to the hand-operating devices?

A. All the time.

Q. 254. What was he paid a month?

A. Well, their wages ran about from \$60 to \$75. The foreman of the power house got \$75 and the balance got \$65, and later on they got \$70. The scale of wages changed with years. The second man in the power house got \$60.

Q. 255. That would be in round figures \$190 to \$200 a month for the extra men?

A. Not that much. Yes, it would be pretty nearly that much.

Q. 256. And that was the case all the way along with this plant?

A. All the time. After we got operating we found that we had to have two men. At the start I operated myself for some time alone, but it was not possible to do it.

Q. 257. Was it ever necessary for you to be advised or informed as to the load conditions at a distance on your circuit before attending to the governing of the wheels?

A. Yes; invariably.

Q. 258. How was that done?

A. By telephone.

Q. 259. Was that true in using all three types of wheels mentioned?

A. Yes, sir; whenever we attempted to use a governor.

Q. 260. Suppose you had not been so informed and a big load came on, such as starting up a 50 or 100 horse-power motor?

A. It would result in shutting down from fifteen to twenty-five pumping stations that the Kern County Land Company was running for their City Water Works. It would shut them down unless it was controlled by hand properly.

Q. 261. Did you ever have any trouble with this hydraulic-engine-operated and hand-controlled relief valve on the outside of the plant?

A. Yes.

Q. 262. What sort of trouble?

A. Well, that would require a little explanation. That gate was set to go up and open the full 12 inches in about 10 seconds, to relieve the pipe-line immediately, before the other gates could get closed down. Then the instructions were also in closing that gate to do it by hand—shutting off by hand—with the other gate which is right on top of the pipe-line between the hydraulic engine and the pipe-line, to shut that by hand and shut it slowly, so as not to cut off that 12-inch stream and produce a shock to the line.

Q. 263. That was an extra valve?

A. An extra gate on top of the pipe-line between the hydraulic engine and the pipe-line.

Q. 264. That is still there today?

A. Yes. The trouble we had, one night one of the men who was a new man and not well posted, got a little excited, and they had to shut down, and they had to

throw that valve open. He went and closed it with the hydraulic engine, putting it down about as quick as it went up, and the result was it blowed the whole side of the gate out and lifted a 500-gallon steel tank about 60 feet away from the power house. That was the result of the shock to the pipe-line. So we had a little experience with pipe-line shock.

Q. 265. About how long was your pipe-line or penstock at that time in which such ram would occur?

A. The pipe-line running from the receiver, as we call it here, to the hydraulic engine, was a very short piece of pipe—not over 3 feet long. After the blow-out I put in that extension.

Q. 266. How long was your penstock back of that?

A. That is 625 feet long.

Q. 267. About what is the angle of inclination of that, if you know?

A. Something like 35 degrees. That is, where it raises here.

Q. 268. When you found the governing apparatus and by-pass device of the Girard installation was failing to give satisfaction, and you had to repair it and to replace breakages, did you call in anybody to consider the matter from an engineering standpoint and attempt to correct the troubles?

A. We had our hydraulic engineer here.

Q. 269. Who was that?

A. Edwin S. Cobb. We had B. C. Van Emon, superintendent of the company that furnished us with the material.

Q. 270. What did they do or try to do?

A. They attempted to adjust it and get it to operating properly.

Q. 271. And was it this Mr. Cobb who also experimented with the attempted by-pass in connection with the Knight wheels?

A. Yes, sir; he designed it.

Q. 272. Was Mr. Cobb here in connection with attempting to operate that last form of by-pass device?

A. He certainly was.

Q. 273. What kind of a valve was that last by-pass?

A. It is the one that is now sealed up in the power house.

Q. 274. Was it of the sliding type or the butterfly type?

A. It was of the sliding type.

Q. 275. Did you know any of the other officers of the Girard Water Wheel Company?

A. No, sir; I did not. I never had the acquaintance of anyone connected with them with the exception of Mr. Van Emon and Mr. Berry, who was a draughtsman, as I understood, in their employ. Those were all the employees I knew of connected with them.

Mr. Blakeslee: Counsel may cross-examine.

CROSS-EXAMINATION.

By Mr. Westall:

XQ. 276. Mr. Dearth, prior to your connection with this power plant you had never had any special mechanical or electrical education, had you?

A. Not along electrical lines; no sir.

XQ. 277. And you never had any technical education along mechanical lines, had you?

A. No, sir.

XQ. 278. Your experience prior to your connection with this plant had been in the carpenter business, had it not?

A. Part of the time.

XQ. 279. And when you were first connected with the plant in 1895 you came here as a carpenter?

A. Yes, sir.

XQ. 280. How long did you work here at this plant as a carpenter before the machinery was installed?

A. From December, '95, to—well, practically a year or fourteen months before we got the machinery in operation; perhaps fifteen months.

XQ. 281. When was the machinery first put in operation?

A. We made a trial run of it in June of—These dates is what gets me—in June, 1897.

XQ. 282. Who was in charge of the plant at the time that first trial was made?

A. I was in charge of that here at all times.

XQ. 283. You were employed as a carpenter and also as superintendent of the mechanical and hydro-electrical features of the plant?

A. I was put in as superintendent of construction, and did superintend the general camp outfit here all the time.

XQ. 284. Did you direct how this machinery should be installed in the plant?

A. No, sir.

XQ. 285. Did you have anything to do with the

planning or with the estimating or the decision as to what kind of machinery should be placed in the plant?

A. No, sir.

XQ. 286. At that time you had no sufficient training or knowledge to enable you to do that intelligently? Is not that true?

Mr. Blakeslee: Objected to as calling for a conclusion. Let the witness testify as to what his qualifications were, if counsel wishes him further to do so.

A. Yes.

XQ. 287. By Mr. Westall: So that your position as superintendent was mainly that of looking after the carpenter construction and taking charge of the camp generally in a supervisory capacity, rather than in a mechanical way. Is that true?

Br. Blakeslee: Objected to as calling for a conclusion on the part of the witness, and an expression of opinion, and not for a statement of facts of what he did or was here to do.

A. That is true; yes, sir.

XQ. 288. By Mr. Westall: And at that time you did not know anything about governors or water-wheels. Is that true?

Mr. Blakeslee: Objected to as indefinite as to time.

XQ. 289. By Mr. Westall: I mean in 1895 at and prior to the first test operation.

A. That is the way I understood the question. I knew nothing about it. (The question is read by the Examiner.) It is true.

XQ. 290. Who was in charge of the mechanical work and by that I mean the installation of machinery in the plant, at the time last referred to?

A. There were three men in charge of that, each one in his respective department—electrical, hydraulic—two men, electrical, hydraulic and on water-wheels.

XQ. 291. Will you please mention each of those men and state what particular department each had in charge?

A. Edwin S. Cobb was hydraulic engineer in charge of the installation of the pipe-line and supervision of it, and other things pertaining to the plant up to the water-wheels. B. C. Van Emon was in charge of the installation of water-wheels and governors. Mr. Lighthipe was in charge of the installation of electrical machinery and switchboard. He was assisted by his brother-in-law, and I cannot recall his brother-in-law's name.

XQ. 292. Will you please describe in a general way the tests that were made just after the installation of the machinery and say how long a period those tests extended over?

Mr. Blakeslee: Objected to as not cross-examination, no foundation laid, the witness not having testified that he had anything himself to do with the tests.

A. That covers a wide scope of territory. It involves a good deal. It involves tests of the hydraulic installation, pipe-line, forebay and everything pertaining to it, and the flume, and tests of the water-wheels and their efficiency, tests of governors and their efficiency, and operation tests of the electrical installation, generators, transformers, transmission lines, and everything pertaining to them, clear to the other end of the line. It is a long job.

Mr. Blakeslee: We ask that the question and answer be stricken out and withheld from consideration on each

of the grounds stated in the objection to the question.

XQ. 293. By Mr. Westall: When was the water first turned into the pipe-line for the purpose of making any kind of a test?

A. I could not give you the date.

XQ. 294. Approximately when?

A. Sometime in June of 1897.

XQ. 295. And was water flowing through that pipe-line continuously thereafter?

A. No.

XQ. 296. When again was water, after being turned into the pipe-line, shut off?

A. Well, there was a test made of the pipe-line, and then it was emptied very shortly afterwards for the purpose of remedying defects which appeared, and turned in again, and an attempt made to start the machinery and defects appeared which made it impossible to do it at that time, and it was shut off and the pipe-line emptied again. No wheels had turned up to this time, you understand. There was no water turned onto the wheels. After these defects were remedied, which took considerable time and involved the walling-in of this pipe line from here to the top of the hill,—it laid on top of the ground and we had to wall it in; the vibration was too great for it. Then we turned the water in again.

XQ. 297. When was this done?

A. Sometime in June or July.— This was going on in June, July and August of that year. Then we commenced to turn the wheels over and making the tests of the water-wheels, governors, electrical apparatus and everything.

XQ. 298. And for how long a period did those tests

of the apparatus that you have mentioned continue?

A. They must have lasted at least two weeks

XQ. 299. And when was that?

A. In June or July of that year. I could not give the exact date.

XQ. 300. These tests continued until sometime in August, 1897?

A. I think so.

XQ. 301. After August, 1897, was the water allowed to run through the pipe-line to a degree that might in any way or in any sense be called continuously?

A. Yes. We got started and tried to run.

XQ. 302. Now, there was a great deal of trouble with various parts of the apparatus which developed during the taking of these tests during the months of June, July and August, wasn't there?

A. Quite a good deal; yes sir.

XQ. 303. And it was discovered that the Girard wheel that was put in did not develop the horse-power that was estimated? That was true, wasn't it?

A. Yes, sir.

XQ. 304. And there was a great deal of figuring for a long time after that to discover what was the matter, wasn't there?

A. Not a very long time. On the second test, I think it was, they gave it up as being an impossible thing to reduce the result to ~~the~~^a guaranty. The company immediately negotiated for other wheels.

XQ. 305. And it was found that the Girard wheel was inefficient and would not produce the results that had been aimed at?

A. It was.

XQ. 306. And that was one of the reasons why the Girard wheel was removed and a Tuthill wheel substituted?

A. That was the reason.

XQ. 307. Now, with the substitution of the Tuthill wheel, the Girard governor was still retained?

A. Yes, sir. Not in the same position. Not all of it located as it was with the Girard. That was a different installation.

XQ. 308. Now, at the time about which you are testifying, namely, in June, July and August, in the latter part of 1897, you did not fully understand what was the matter, did you?

A. No.

XQ. 309. It is a fact, is it not, that even the engineers in charge did not thoroughly understand just what was the matter during the test, and it took a great deal of experiment and time to understand what these defects were caused by?

Mh. Blakeslee: Objected to as being a double question and calling for two answers. Furthermore, it is objected to on the ground that it is indefinite and calling for a conclusion of the witness as to the opinions of other witnesses, and therefore not proper testimony and not the proper method of proof.

A. That is two questions. The first one, I know nothing about what the engineers thought or what conclusions they came to, or what they thought they were up against. As to the latter part of the question, they consumed a great deal of time in experimental work. There was not very much experimental work done along that line.

XQ. 310. By Mr. Westall: But at that time you did

not know what the defects were? Such knowledge as you now possess has been acquired since that time?

Mr. Blakeslee: Objected to as indefinite and as merely argumentative and not calling for a statement of facts and as being a double question.

A. I only knew what the results were. That is all. (Second part of question read by Examiner.) Yes, sir; beginning with that time.

XQ. 311. By Mr. Westall: What kind of a governor was used with the Tuthill wheel that was put in when the Girard wheel was taken out?

Mr. Blakeslee: Objected to as merely repetition. The witness has already fully testified to that.

A. The governor was the same. The application of it was different.

XQ. 312. By Mr. Westall: And how was the amount of water that was propelled against the buckets of the wheels governed in the Tuthill wheel?

A. By a deflecting plate sliding over the nozzles.

XQ. 313. Now, with that kind of a method governing, the by-pass which had previously been used with the Girard wheel was not necessary?

A. Not at all. That was abandoned long before.

Mr. Blakeslee: Objected to as calling for a conclusion.

XQ. 314. By Mr. Westall: And the reason that it was abandoned was because a new method or a new principle of governing had been adopted in its place?

Mr. Blakeslee: Objected to as calling for a conclusion, not the proper method of proof, and not calling for a statement of facts.

A. No.

XQ. 315. By Mr. Westall: Is it your understand-

ing that with the deflecting nozzle that the by-pass is needed ?

A. It is not.

XQ. 316. And so it is true, then, that when the deflecting nozzle of the Tuthill wheel was used, it made the by-pass no longer necessary in the governing?

A. That was not a deflecting nozzle. It was simply a steel plate passing in front of the nozzle.

XQ. 317. That is what I mean. But it is something of the same form?

A. Yes, sir; the effect is the same, practically.

XQ. 318. Now, you have stated the Tuthill wheel was replaced by a Knight wheel.

A. Yes, sir.

XQ. 319. What kind of a governing apparatus was used with this Knight wheel?

Mr. Blakeslee: Objected to as being repetitions and having been answered before.

A. The same. It was a Girard governor.

XQ. 320. And how was the amount of water that was propelled against the buckets of the wheel regulated?

A. That is a pretty hard question to answer, because it involves a description of the mechanical device which the engineer who designed it did not seem to be able to name himself. It consisted of two rings in the shape of a tee-iron which closed over the nozzle to open and shut. It was operated by a system of bell-cranks inside of the water-wheel case, and they were actuated by this same hydraulic engine that the Girard Water Wheel Company put in, only it was located in a place convenient for that operation.

XQ. 321. When the water was shut off from being propelled against the buckets of the wheel in the device about which you have just testified, what became of the surplus water that was then shut back into the penstock?

A. There was a by-pass provided to take care of that water.

XQ. 322. And how was that by-pass regulated?

A. It operated from the hydraulic engine in unison with the operation of the controlling plate inside of the water-wheel gate.

XQ. 323. Was that under the control of this Girard governor at that time?

A. Yes, sir.

XQ. 324. And how long was the Girard governor used in that connection with this Knight wheel?

A. Not to exceed fifteen minutes.

XQ. 325. After its use was discontinued what did they do with the surplus water that was shut back into the penstock when it was shut off from being thrown against the buckets of the wheel?

A. This butterfly valve was introduced at that time in the Knight water-wheel which is now controlling the plant and has been ever since. A man was placed right here to handle it. We hired an extra man and put him on there to take care of it. The handle was worked by hand then entirely.

XQ. 326. And since that Knight wheel has been put in this method of manual operation has been retained continuously all during the time you were connected with the plant?

A. No, sir. I understand your question since the

time that this last device broke down in about fifteen minutes?

XQ. 327. Yes.

A. No, sir.

XQ. 328. What kind of a governing apparatus was used after that? Or describe just how the governing apparatus had been changed.

A. It was a scheme devised by Mr. Beal. He was very anxious to get some kind of a governing device on the wheels and we manufactured it, installed it and put it on, but operated it with the Girard water-wheel device and the same hydraulic engine. Then we installed the safety valve.

XQ. 329. Will you please describe the last device which you say was originated by Mr. Beal?

A. It is a pretty hard thing to describe. The nozzle block that operates the Knight wheel is about, pretty nearly, a half circle. It is divided into six square ports, and the wheel runs very close to that nozzle block. Mr. Knight claimed that it was part turbine in its effect--pressure as well as speed. They cut away that nozzle block just enough to introduce a bronze plate which was cast on the same circle as the nozzle block, and they operated by bell-cranks similar to Cobb's device, on the inside of the water-wheel case, by the same hydraulic engine and system of bell-cranks back to the dynamometer in the fly-wheel. That would open and close and shut off the volume of water.

XQ. 330. That plate that you have described operated to shut the water from being propelled against the buckets of the wheel in substantially the same manner

that the previous device that you have described did?

A. That is right.

XQ. 331. And how was the excess of water which was thus shut back into the penstock disposed of?

Mr. Blakeslee: Objected as indefinite.

A. We took our chances on a wreck. That was all there was to it. In plain words, we risked it.

XQ. 332. By Mr. Westall: And how long was this new method of governing used?

A. I think, if I remember right, it was about four or five months. We only had two machines in the power house. Before we put the third wheel in we abandoned the whole business entirely and used hand control, and put on the safety valve on the pipe-line.

XQ. 333. In what year?

A. That was in 1898 when they put the Beal governor on, according to my recollection.

XQ. 334. And about what time of the year were the four or five months that you have mentioned?

A. Well, it was the latter part of the year, I think.

XQ. 335. At the expiration of those four or five months, what kind of governor, or what kind of governing, was attempted?

A. Nothing. The men governed it and hand-controlled it.

XQ. 336. And so, since the latter part of 1898 or the early part of 1899 there has been no governing attempted other than the manual means that you have described?

A. That is right.

XQ. 337. And it has been found that such governing was adequate for all purposes of this plant?

Mr. Blakeslee: Objected to as calling for a conclusion

of the witness and not for a statement of facts, and being a statement of opinion.

A. It was not.

XQ. 338. By Mr. Westall: Would you say that such method of governing has been unsatisfactory?

A. Yes, sir.

XQ. 339. And during the time that this hand governing that you have described had been used, you say that the company has been expending on an average of \$180 or \$200 a month extra that it would not be required to expend if it had an adequate automatic governor?

A. It would do away with the services of one man continuously, or three men.

XQ. 340. And would save that amount of money?

A. Yes, sir; it would be three men out. That is demonstrated here right now. They run the plant with one man right along.

XQ. 341. Isn't it a fact that there has been no occasion for very strict or careful governing of the water-wheels of this plant?

A. No. We need the best government in the world for efficient service.

XQ. 342. Isn't it true that during the time that you have been connected with the company that the loads imposed have been very uniform?

A. No. That is a hard proposition.

XQ. 343. Is there at the present time any means connected directly or indirectly with this plant for automatically governing the speed of the water-wheels?

A. Only remote.

XQ. 344. Will you please describe such remote means?

A. This plant is tied in with two other plants, the steam plant in Bakersfield which has a third higher capacity than this, and a power plant above Fresno—the Crane Valley plant, I think it is—which has four times the capacity of this. The rule of practice is that the plant with the highest available power controls the whole thing. The man at the Crane Valley switchboard handles this as well as the man here. This is controlled absolutely by them.

XQ. 345. And it is true that this remote control that you have spoken of makes it possible to dispense with automatic governing which would not be possible if this plant were isolated?

A. That involves a good deal more than a simple answer of yes or no.

XQ. 346. But you would say, would you not, that this is an important factor in the determination of whether or not an automatic governor should be used here?

A. I will answer that by saying that it is an important factor in the governing of the system. That involves a good deal more than yes or no. The answer is good for when they are both on the line.

XQ. 347. So that if those plants were cut out it would require very great care and attention to prevent trouble, or to prevent injury to the pipe-line here, would it not?

A. There would be more danger of disorganizing your service.

XQ. 348. And from your long connection with this plant, would you not say that the fact that this plant is connected up with the other two plants that you have

mentioned, is one of the reasons why a modern governing apparatus has not been installed?

A. That is something I know nothing about. My interest in the company passed out with my resignation, and I don't know anything about what reasons they have for doing what they are doing.

XQ. 349. But prior to your severing your connection with the company you were in touch, to some extent, were you not, with the policy which declined to avail itself of the latest modern improvement?

Mr. Blakeslee: Objected to as stating a conclusion and calling for an expression of opinion, indefinite, and not calling for a statement of fact.

A. Do you mean the present company?

XQ. 350. By Mr. Westall: I mean the company that you were working for.

A. That I understood their policy of not installing something here?

XQ. 351. Yes.

A. My impression always was that they got pretty badly discouraged with the expense and the disappointments, and they concluded that they better stand the expense of the extra men than the expense of putting in another installation and trying it out and meeting with some such a result with which they had already met. That is what I concluded, if you want my conclusion. That is a long way to answer the question, but that is what I thought they had in mind.

XQ. 352. So that you believe the experience that the Power Development Company had with the Girard wheel and with the Girard governor that you have described, has been the cause of the failure of the Power

Development Company, and the Power, Transit & Light Company, to avail themselves of modern governing means?

A. I will say my knowledge of the company's policy and their inclination in this matter was that they anticipated disposing of the plant, and that they were satisfied to try and get along with what they had and not incur any further expense.

XQ. 353. So that you do not believe that the experience the Power Development Company seventeen years ago with an automatic governor has been the only and sole reason why they have not put in an automatic governor since that time?

Mr. Blakeslee: We object to this question and this line of questioning, as not calling in any respect for a statement of facts. We are not concerned here with the mere belief of this witness as developed on cross-examination, but we want to have from him a statement of fact as to what is within his knowledge. His belief, unsupported by a statement of fact, is not proper testimony in the case, nor is it in any case.

A. That is a question that I won't try to answer, because I never considered anything of the sort.

XQ. 354. By Mr. Westall: You were not close enough in touch with the management of the company to have any knowledge for the reasons of the policy which prevented them from availing themselves of the modern improvements in governing apparatus? Is not that true?

Mr. Blakeslee: Objected to as calling for a conclusion and not for a statement of facts, not the proper method of proof and not cross-examination. The witness testi-

fied that he was superintendent of this plant for a great many years, and his testimony should concern his experience and knowledge only from such position as superintendent and any of the work he did in and about this plant.

Mr. Westall: It is submitted that the question calls for the relation of the witness to the management of the company and to the operation of the plant, and the reason why certain apparatus was not installed, and that the witness has testified very fully on direct examination concerning those same things.

Mr. Blakeslee: The witness can only testify by stating questions of fact as to the duties he performed, in the position or positions he filled. Aside from that, he cannot state competently what the policy of some other official or officials was, which officials had their own spheres of activity apart from him, and the proper method of proof would have been to have called such officials while they were taking their other proofs pertinent to this plant.

Mr. Westall: If he has testified that automatic governors were taken out, and he has suggested why they were taken out, it is perfectly competent to inquire further what other reasons there may have been for not installing or keeping such governors, and the question is merely directed to bring out that additional knowledge.

Mr. Blakeslee: If that is true, let the question be asked of the witness what other reasons there were. That is, what other reasons might have come within his knowledge. It is not proper to ask this question as to what other reasons in these respects there may have been within the operation and thought and plant and

policy of some other official or officials of this company.

A. No; I hardly think that is true.

XQ. 355. By Mr. Westall: So that you consider that you are fully acquainted with all of the reasons which prevented or governed the actions of those in control of the company in neglecting to avail themselves of any form of efficient automatic government. Is that correct?

Mr. Blakeslee: The same objection.

A. No. I don't know all their thoughts and business, by any means.

Mr. Blakeslee: We ask that both this question and the last previous question and answers to each part and parcel thereof be stricken out and withheld from consideration, on each of the grounds just urged to these questions.

XQ. 356. By Mr. Westall: Then you would say there may have been important reasons other than alleged inefficiency of this old Girard governor, which have influenced the actions of those in charge of the company, in refraining from using any method of automatic governing since that time. Is that true?

Mr. Blakeslee: Objected to as merely argumentative, not the proper method of proof, not calling for a statement of facts, and merely calling for a wide guess. And, furthermore, that it is indefinite and not cross-examination.

A. I think I answered that question a while ago in the only way that I can possibly answer it. You will find it back there, that they thought it cheaper to maintain the plant the way they were running it than to in-

stall something and meet up with the disappointment that they had already met up with.

XQ. 357. By Mr. Westall: Then you believe financial reasons may have had considerable weight in determining the action of the company in refraining from availing themselves of the latest modern governing apparatus?

Mr. Blakeslee: Objected to as indefinite and not the proper method of proof and not calling for a statement of facts, but merely for a statement of belief, which, when unsupported by a statement of facts, is not competent testimony, according to all rules of evidence.

A. No, sir.

XQ. 358. By Mr. Westall: Then the only reason that you can give for the failure of your company to use the Girard wheel and governor? Is that correct?

Mr. Blakeslee: Objected to upon each of the grounds urged against the last several questions, and as being merely repetitious. Furthermore, that it is not in accordance with the testimony previously given by this witness, and is misleading, and is not the proper method of proof.

A. No.

XQ. 359. By Mr. Westall: Do you believe that those experiments of seventeen years ago have had any weight in determining the course of the company with which you were last connected in refraining from using some form of automatic governor?

Mr. Blakeslee: The same objection, and that it is merely repetitions, and we call the attention of the court to the fact that we have warned counsel in our objection not to deal with this witness as to matters of mere

naked belief unsupported by facts. And if counsel persists in this line of cross-examination, we move that the cost of taking and returning this deposition, or, at least, the cross-examination thereof, be taxed against the defendant, it being merely incumbering the record and improper. This is the rebuttal case and not the defense case.

A. Well, that is a pretty hard question to answer. I think I understand the situation pretty thoroughly why the company has never attempted to put any other governor in, and I think I have explained that as far as I understand it. Of course, you understand that the experience we went through with was educational. They discovered a great many things that they possibly did not know when they started in, and, among others was that this was a plant of its own, with its own peculiarities, and not to my knowledge has anybody ever offered to install a governor here that they thought would do the work since. They possibly may have done it. The question has never come up in my presence, and I never have asked the company to install a governor, and my experience was so very discouraging, and when I say "discouraging", I say emphatically that it was.

XQ. 360. By Mr. Westall: And your early experience was such that you became convinced that automatic government of any kind would be a failure?

A. No, sir. I am too progressive for that. There is not any such thing as that in my vocabulary.

XQ. 361. Do you believe that those connected with the company had any such ideas?

Mr. Blakeslee: We again object to this question as not the proper method of proof, not calling for a state-

ment of facts, and that the parties who are concerned are not here to testify, and that the defendant had his chance to get them to testify, if it wished or dared to.

A. I couldn't express what my belief would be in reference to the company's ideas.

Mr. Westall: It is submitted that this witness testified that he had the management of this plant for a great many months. Having the management of the plant, it is certainly competent and proper for him to testify why certain apparatus was not used or why it was used. He has partially done that on his direct testimony, and the present questions are directed merely to bring out those additional facts more clearly.

Mr. Blakeslee: There are only certain facts which any witness can testify to, and those are the facts within his knowledge. The witness may believe that there is a heaven and that he will go to it, but he cannot testify about any such heaven here.

XQ. 362. By Mr. Westall: Were any of those who were connected with the company in 1897 and 1898 connected with the company at the time you severed your employment with it?

A. None that I was acquainted with had anything to do with it.

XQ. 363. So that any of the discouragements that may have come to you in 1898 were communicated to the persons who were subsequently interested in the company and operated to discourage them as well as the former owners. Is that correct?

Mr. Blakeslee: Objected to as merely stating a conclusion and not asking a question, and not the proper

method of proof, indefinite and vague, it not being known how a discouragement could be communicated.

A. You have got me into a question there that is impossible for me to answer. The only change in administration that occurred from 1898 up to the time my resignation went in was with the general manager in Bakersfield. Mr. Beal resigned, and a gentleman by the name of Goodwin succeeded him in the management of the business affairs of the company. This was a part of it—the operation. Mr. Goodwin died and Mr. Harry Jastro succeeded him. There is no use my talking to you about things that I don't know or things that I do know but cannot swear to. The power behind the throne, I know who that was from hearsay; but the manager here had nothing to say about any improvements, or anything of that kind, concerning this plant, whatever. He simply took hold of what was here and operated it as it was, to the best advantage.

XQ. 364. By Mr. Westall: Now, in 1897, when the water was first turned into the penstock, what were your particular duties?

A. I had charge of everything. I might substitute that by saying that I was superintendent. That covered the whole thing.

XQ. 365. Was it part of your duty to consult with Mr. Cobb and Mr. Van Emon and others who were planning the installation of machinery, as to what machinery should be used, and as to how it should be assembled for any of that work?

A. Each one of those men came here with their devices to install them, guaranteeing certain results, and I had nothing whatever to do with them only to see that

they were comfortably housed and fed, and had all the labor they needed.

XQ. 366. And during those tests of the Girard wheel and the Girard governor you continued to perform those same duties?

A. I was superintendent.

XQ. 367. And so that with your education and training and experience with things mechanical and hydraulic and electrical, you did ^{not} know and did not attempt to pass judgment at that time upon the efficiency of the various apparatus which were being tested, did you?

Mr. Blakeslee: Objected to as indefinite with respect to the use of the word "efficiency." The witness testified that he was superintendent and that he observed the results of the apparatus. With such testimony we insist that the use of the word "efficiency" coming within the knowledge of the witness, the question should be more specific.

Mr. Westall: The word "efficiency" has been used several times during the course of the examination, and it is a word in common use, and I believe the witness thoroughly understands its meaning.

A. I was thoroughly conversant with the contracts for the different apparatus, hydraulic and electrical, and what they were expected to do, and the only knowledge I have was the result we got from the test.

XQ. 368. By Mr. Westall: But at that time you had no means of comparing those results with results of other plants?

A. No, sir.

XQ. 369. And so at that time you did not know

whether the work was progressing favorably or otherwise, did you, except what you heard from hearsay from stray remarks of the engineers and others during the progress of the work?

Mr. Blakeslee: Objected to as indefinite and calling for a conclusion.

XQ. 370. By Mr. Westall. I am talking about your knowledge, since you may have gained a good deal of knowledge since that time. I mean your knowledge at that time.

A. You are getting into a technical part of this which I cannot swear to at all. I had a superficial knowledge of what to expect; that is, I knew the pressure on that pipe-line, the spout velocity of the water and the result it should give on the wheel. I knew the rated capacity of the generators, the power that was applied to them and what result we could expect from them. I knew the range of variation that speed would give, and I knew what we ought to expect of the regulation of the speed in order to maintain a certain voltage without too much variation. That part I have learned. I have studied it up to learn it. No engineer told me. I have text-books here and figured it out myself.

XQ. 371. You studied that before the water was turned in to the penstock?

A. Yes, sir. I did not have much knowledge, but those few simple facts I acquired so as to know where I was getting off at.

XQ. 372. And during all this time you were superintending the erection of the buildings and housing of the men?

A. Yes, sir.

XQ. 373. How much time did you spend in the plant during the tests?

A. During the tests I was in the plant all the time. The construction work was completed.

XQ. 374. The reason the Girard wheel was taken out was because it did not develop the required horsepower?

Mr. Blakeslee: Objected to as calling for a conclusion and not for a statement of facts.

A. Yes, sir; that is the reason.

XQ. 375. By Mr. Westall: And it is also true that when the new wheel was put in it had a method of governing which did not require the use of a by-pass. Is that true?

A. When the Tuthill wheel was put in; yes, sir.

XQ. 376. Did you take actual charge of the building of the various sheds and houses adjacent to this plant?

A. I did.

XQ. 377. How long did it take you to build the bridge you speak of, half a mile below the power house?

A. We were about five or six weeks on that.

XQ. 378. That was in 1895?

A. Well, we commenced it the day before Christmas, 1895, and finished it up in 1896.

XQ. 379. And after that time were you engaged in putting up buildings in or near and adjacent to the plant a good deal of the time?

A. After the bridge was completed we commenced delivering lumber here for a flume. We had a camp of probably eighty or ninety men in the camp working at rock work, putting up the power house site. I had thirty

or forty men shooting out rocks for the power house and room for the cottage, and building the flume, and delivering the lumber up there and hauling it up on the hill, to get everything equipped so as to handle it nicely.

XQ. 380. How long did you work at that?

A. We finished the flume in October of that year.

XQ. 381. 1895?

A. 1896.

XQ. 382. Then what construction work were you engaged in?

A. We finished the power house about a month later. Of course, you understand that I did not do this work. I had a set of plans drawn by a mechanical draughtsman, and I just hired the men and put them at it and saw that they did the work. I was not around here working with tools at that time at all. I was superintending the work.

XQ. 383. And how much of the time did you spend at the various buildings in superintending the work of the men?

A. I spent probably nine hours of my time a day.

XQ. 384. How long did that continue?

A. That continued from the time I commenced that bridge until the power house was completed.

XQ. 385. When was the power house completed?

A. In the fall of 1896.

XQ. 386. So that at the time they commenced the installation of the machinery and apparatus all the buildings that are now on the property had been constructed?

A. No; not all of them.

XQ. 387. And during the making of those tests were you engaged in any other building operations?

A. No, sir.

XQ. 388. You had completed all those operations?

A. Yes, sir.

XQ. 389. How did you spend your time after the completion of those buildings?

A. Operating the plant when they got started. When they were installing I was right with them all the time. While I was working nine hours a day here on an average and perhaps a good many days ten in the construction work, I was spending four or five additional hours studying up hydraulics and electricity. So I put in about fourteen or fifteen hours a day right straight through.

XQ. 390. How much time did you put in in studying electricity before they first let water into the penstock?

A. Oh, it was probably a year that I had taken the study up.

XQ. 391. And out of that time had you put in five hours a day study?

A. Averaged that; sometimes more, and perhaps sometimes less, but it was about five hours.

XQ. 392. That is, you worked nine hours and put five hours more in, which would make fourteen hours?

A. We did not have union rules here then.

XQ. 393. And the rest of the ten hours was spent in rest and recreation?

A. Yes. There was no recreation about it. You can leave that out.

XQ. 394. You have described or mentioned a butterfly-valve used with the Knight wheel. How long was that butterfly-valve used after it was first adopted?

A. It was used all the time, ever since the wheel was installed.

XQ. 395. And was it used up to the time that you severed your connection with the company?

A. Yes, sir; it is in use there yet.

XQ. 396. You have stated the company has been expending between \$180 and \$200 a month for extra help to operate the manually controlled apparatus.

A. We employed three extra men, and their average wages would be \$65. You can figure that up to suit yourself.

XQ. 397. And you have also testified that if an efficient governor had been employed, or if the Girard governor had met the expectations, it would not have been necessary to employ these extra men or expend this extra money.

Mr. Blakeslee: We object to counsel reciting the testimony as he has in the last question. If that is the testimony, it is. If counsel wishes to cross-examine in regard to the testimony, let him do so. It merely incumbers the record.

XQ. 398. By Mr. Westall: Is it your understanding that those in charge of the company have been expending this money all these years because of the discouragements that they received while experimenting with this old Girard governor?

Mr. Blakeslee: Objected to as repetitious and not calling for a statement of facts, not the proper method of proof, a mere statement of the witness's opinion, the witness not being competent to testify as to what was in the minds and in the policies of other officials.

A. I could not tell you what was in the minds of our managers.

XQ. 399. By Mr. Westall: Did you ever recommend the adoption or installation of any form of automatic governor?

A. No, sir.

XQ. 400. Did you ever have any conversations with any of those in charge of, or having the management of, or who might influence the management of the company, respecting the installation of some form of automatic governors?

Mr. Blakeslee: We object to this question as being grossly a violation of the laws of evidence, it not being shown that as to any such purported conversation either of the parties to the suit were present.

Mr. Westall: I am asking him if he had any conversation.

A. No, sir.

XQ. 401. So that during the seventeen years since you tried that Girard governor, there has never been any suggestion by you or to you as to the employment of any form of automatic governor?

A. No suggestion been made ^{by} me, and as to being made to me, I have no recollection of anybody approaching me on the subject.

XQ. 402. As superintendent of the plant, were you not vitally interested in giving the most efficient service and protecting the pipe-line in every manner that could be devised?

A. Certainly.

XQ. 403. And knowing that automatic governors would give better and more efficient service, you did not

consider it worth while to take it up with any of the managers of the company?

A. No, sir.

XQ. 404. Will you please state any reasons that you may have for not taking up a matter of such vital importance with those who had charge of the management of the company and to whom you were responsible for the efficient and safe operation of the plant?

Mr. Blakeslee: Objected to as not cross-examination of the witness, it not having been shown that he had anything to do with the advising of the installation of the plant, no testimony being given but that he was superintendent of the plant to run it with the apparatus that was given him. Therefore, no foundation has been laid for the question, and it is not the proper method of proof.

A. I cannot recall any reason now that would answer that question.

XQ. 405. By Mr. Westall: Did you keep any books relating to your duties as superintendent and the payment of moneys necessary to be made in the operation of the plant?

A. I kept a time-book of my employees and who my employees were, the log book in the power house in the operation of the plant, reading of the instrument, temperatures, the weather, rainfall, and everything of that kind. That is all the books I was required to keep.

XQ. 406. Did you ever have any discussion with any of those in charge of or to whom you were responsible in the management of the company about this \$180 or this \$200 which was being paid to these extra assistants?

A. No, sir. That I left entirely in their hands.

XQ. 407. So you did not consider it part of your duties as superintendent to advise those in charge of the company that they might save something like \$180 or \$200 a month by the employment of an automatic governor?

Mr. Blakeslee: Objected to further on the ground that no foundation is laid for the question, it having been shown by the testimony of the witness that as to all these matters relating to the control of the plant, aside from his superintendence, there was a general manager of the plant, one Beal, and the defendant should have called that general manager if he wanted to know why the general manager did or why he did not do certain things.

A. I never felt it was my duty to inquire into the policy of the management of my company. That matter was entirely in their hands.

XQ. 408. By Mr. Westall: So that your duties were simply to obey the directions of some person higher up in the company?

A. I was operating under orders all the time.

XQ. 409. And your advice as to the efficiency of the machinery or the expenditure of money for maintenance was never sought by the company?

A. No, sir.

XQ. 410. And you did not pose at any time as one competent by education or experience to advise with the management as to the efficiency of the wheels or the other parts of the machinery or as to the financial management of the company?

Mr. Blakeslee: Objected to as calling for a mere

statement of conclusion on the part of the witness, based upon supposition as to the posture of this witness. What his posture was and what he did and what he knows are separate things, and his posture has nothing to do with this case.

A. The company had an efficient engineer. They were evidently capable of taking care of their own finances, and I considered I had all I could do here and I didn't bother myself a particle about their engineering department, or the expense of operation, as long as I did not hear any complaint from them coming up to me.

XQ. 411. By Mr. Westall: So that you cannot say, having no means of knowing, why the company did not install some form of automatic governor?

A. No, sir; I couldn't tell that.

XQ. 412. And you do not know that the early failures, as you have described them, of the Girard wheel or the Girard governor, had anything to do with the failure of the company to install some automatic form of governor. Is that correct?

A. I don't know anything about that; no, sir. I had no means of knowing it, and I was not in their confidence.

XQ. 413. Now, during the testing of the plant in 1897 and during the time the Girard water-wheel was being tried, you, as superintendent of construction were not called into consultation with Mr. Van Emon or Mr. Cobb or the electrical men as to the cause of defects in the operation of the machinery, were you?

A. No, sir.

XQ. 414. And any information that you acquired as to the operation or as to the defects or alleged de-

fects of any of that machinery was based simply upon what you overheard and what you observed at that time. Is that correct?

A. Based upon my experience in trying to run it afterwards.

XQ. 415. In trying to run it after the completion of the tests?

A. After the completion of the tests, and after they were gone.

XQ. 416. How long was the Girard wheel and governor in use after they completed their tests and left?

A. I couldn't tell. Long enough so that we could install another wheel. Possibly five or six months.

XQ. 417. And was this Girard wheel and governor used continuously during that four or five months?

A. Well, all that we could make it do.

XQ. 418. Was your plant in a position to use the work of that wheel during those five or six months, or were other parts of the apparatus also found to be defective during that time?

A. Well, we had one wheel in service, and you understand that this electrical load is a fluctuating load. At one time of the night you have the peak load, and then you have quarter-load, or a third-load. The one wheel had to do all that we did do.

XQ. 419. But during those four or five months, being a new plant, there were defects in the different parts of the machinery, in the parts that were electrical and the parts that were hydraulic?

A. I don't recollect our having electrical troubles, unless it was some trouble with the lines. Our electrical

engineering went from the word go, and very satisfactory.

XQ. 420. After Mr. Cobb and Mr. Van Emon had completed their tests and had left the plant, were your duties changed in any way? Or were you still then occupying the same position as superintendent of the plant?

A. I was superintendent.

XQ. 421. And who was in charge of the machinery at the time?

A. I was.

XQ. 422. And whom were you assisted by at that time?

A. In the electrical department there was a brother-in-law of Mr. Lighthipe left here for thirty days. In the hydraulic, I took care of it myself.

XQ. 423. And in case anything got wrong with the machinery, or anything, did you undertake to repair it yourself?

A. If it could be done here, I did; if it could not, I called a mechanic from town.

XQ. 424. Was it necessary to have a mechanic here from town at times?

A. Oh, yes.

XQ. 425. So that any particular work which required an understanding of mechanics, you called in one who would understand the operation of devices and would be able to make those repairs?

A. When anything occurred there that we did not have the facilities to handle it with here, I got a thoroughly competent machinist from town to do the work.

XQ. 426. Did you have any machinist here, or any-

one who understood the handling of mechanical devices, upon whom you depended during the first five months that you were in charge?

insert A. No, sir.

REDIRECT EXAMINATION.

By Mr. Blakeslee:

RDQ. 427. Will you please furnish to Mr. Henry a sample of water which is now supplying the power plant of the Power Development Company, or Power, Transit & Light Company plant, such water to be taken from the pipe-line or penstock of the plant.

Mr. Westall: Objected to as not proper redirect examination, and not proper rebuttal. The kind of water that is here at the present time cannot have any pertinency to the present proceeding. The apparatus which is alleged to have been used here was used in 1898. There may possibly be various reasons why there would be great changes in the water during all that time, and it is not sufficiently shown that there are not such changes.

Mr. Blakeslee: Let the record show that the witness has complied with this request, and a sample of water is now delivered to the Special Examiner in a bottle with a stopper, and the Special Examiner will at all times keep the same in his possession, subject to such tests as may be made of it, during which tests counsel for both parties are to be present. This bottle in its present condition is offered in evidence as "Complainant's Exhibit Bottle of Kern River Water at Power Development Company Plant."

Mr. Westall: Let the record also show that the offer is objected to as irrelevant, immaterial and incompetent,

not proper redirect examination, not proper rebuttal, for the reasons before stated.

(The said bottle of water so offered in evidence is marked "Complainant's Exhibit Bottle of Kern River Water at Power Development Company Plant.")

RDQ. 428. By Mr. Blakeslee: When the plant of the Power Development Company with the Girard apparatus was completed, it was turned over in such completed condition to you for operation under your supervision as superintendent, was it?

A. It was.

RDQ. 429. The Girard governor as used with the Tuthill wheels was only used as a coupling between the wheel shafts and the generator shafts?

A. It was used just the same as it was with the Girard installation—the installation in the wheel case.

RDQ. 430. Did it do anything, however, besides coupling these shafts?

A. When it was governing the Tuthill wheels?

RDQ. 431. Yes.

A. Yes, sir.

RDQ. 432. What did it try to do?

A. Governing the volume of water delivered to the wheel.

RDQ. 433. By means of the control of the deflector-like nozzle?

A. Yes, sir.

RDQ. 434. Was there at any time in your mind a doubt as to what was the trouble with the experimental by-pass device installed with the Girard water-wheel?

Mr. Westall: Objected to as not calling for a statement of facts, but as calling for a psychological condi-

1704 5 Mr. Blakeslee: We object to that as, in view
of the previous question, he did have at times
a mechanic here from the city.

Mr. Westall: That is all.

Page Line

1705 5 add "together with the title of the court and
cause and the date upon which said exhibit
was offered"

1705

tion, if we might use the word, or inquiring into the psychological condition of the witness rather than calling for specific facts. The witness has already testified as to how the matter was coupled up, and as to the facts; and the question is further objected to as not proper redirect examination.

A. No, sir; there was no doubt.

RDQ. 435. By Mr. Blakeslee: Were there any deflecting nozzles on the water-wheels of the Knight type at any time?

A. No, sir.

RDQ. 436. And, therefore, would it or would it not have been advantageous to have a by-pass on the pipeline in connection with the use of these water-wheels?

Mr. Westall: Objected to as purely argumentative, calling for the conclusion of the witness, calling for matters of opinion concerning which the witness has not been shown to be qualified to give an opinion; and, further, as not being proper redirect examination.

A. It would have been.

RDQ. 437. By Mr. Blakeslee: Is that the reason the second sort of by-pass was put on and attempted to be used?

Mr. Westall: Objected to as calling for matters of opinion as to which the witness has not been shown to be qualified to testify.

A. It was.

RDQ. 438. By Mr. Blakeslee: Was there any other by-pass used with the Knight wheels at any time under control of the governor, that is, the Girard governor, than the one which was put in and operated, as you have testified, for about ten minutes?

A. No, sir.

RDQ. 439. Why is it that the operation of this plant, independently of any other plant, at the times that you were with this plant, required careful governing?

Mr. Westall: Objected to on the ground that the witness has not been shown to be qualified to testify as to questions of opinion calling for the training and experience of a hydraulic engineer.

A. To secure good, efficient service for patrons.

RDQ. 440. By Mr. Blakeslee: If careful governing is not provided, in what respects is service so provided inefficient?

Mr. Westall: The same objection.

A. The lighting system is fluctuating and the motor service is interrupted.

RDQ. 441. By Mr. Blakeslee: And how about pipe-line conditions?

Mr. Westall: The same objection.

A. Without good governing it subjects the pipe-line to more or less heavy strain.

RDQ. 442. By Mr. Blakeslee: Do you know any specific particulars in which the conditions at this Power Development Company plant differ from the conditions to be dealt with at other plants where automatic government, or any other kind of governing, is in use?

A. No; I do not.

RDQ. 443. Can you give the names of the companies with whose lines the circuit supplied by this Power Development Company plant is now connected?

A. The San Joaquin Light & Power Company is one corporation.

RDQ. 444. Do you know anything about the governing apparatus that plant has?

A. No, sir.

RDQ. 445. What particular plant of this company is the plant of this company connected up with in that manner, if you know?

A. The steam plant in Bakersfield and the hydro-electric plant in the Crane Valley.

RDQ. 446. When was it that this Power Development Company plant which you are talking about was coupled up with the other plants by a merging of the circuit of this plant with the circuits of the other plants?

A. I cannot answer that.

RDQ. 447. Was it during your connection with this Power Development Company as its superintendent?

A. It was not. We were running absolutely alone.

RDQ. 448. Is the regulation of this plant at the present time on this line, that is, the circuit of this plant, a good regulation?

A. The service is fine.

RDQ. 449. How do you know that?

A. I am enjoying the lights every night, and I see the motors run in town.

RDQ. 450. Do you know what kind of a governor is employed on the Crane Valley plant?

A. No; I do not.

RDQ. 451. Do you know which of the two plants connected up with the line of this plant is doing the regulating, the steam plant or the hydro-electric plant?

A. Only by what I have been told.

RDQ. 452. Did you at any time have anything to do with the ordering or specifying of any of the water

wheels or governing apparatus of either the Girard, Tuthill or Knight types originally furnished to this Power Development Company plant?

A. No; I did not.

RDQ. 453. Am I correct in stating that it is the same Mr. Cobb who assisted in the original installation of the Girard wheel who attempted to install the second by-pass device in the pipe-line for the Knight wheels?

A. Yes, sir; the same Mr. Cobb.

RDQ. 454. And in either of these two devices did the by-pass devices do what Mr. Cobb planned they would do, and do what you as superintendent were given to understand that they were intended to do?

Mr. Westall: Objected to as calling for the guess of the witness as to what Mr. Cobb may have planned, and on the further ground that there is no evidence that this witness was given to understand that they would do anything.

A. No, sir.

RDQ. 455. By Mr. Blakeslee: Before you attempted to operate either of these by-pass devices were you shown a guaranty that the same would operate as therein referred to?

A. I don't recollect seeing it.

RDQ. 456. Were you told that they would operate?

A. Yes, sir. Mr. Beal told me.

RDQ. 457. What did he tell you?

Mr. Westall: Objected to as calling for hearsay.

RDQ. 458. By Mr. Blakeslee: What did he tell you?

A. That they were guaranteed to do the work to effectually safeguard the pipe-line.

RECROSS-EXAMINATION.

By Mr. Westall:

RXQ. 459. Having had nothing to do with the ordering of any apparatus connected with either the Girard wheel or the Tuthill wheel or the Knight wheel, you are not in a position to know the secret motives or reasons that might have prompted the change from one wheel to another, are you?

Mr. Blakeslee: We object to counsel testifying without being sworn. The question is a mere statement of observations on his part, and cannot be testimony in the case, and the question calls for a conclusion and is argumentative.

A. I have no knowledge of what their secret thoughts were. I only know that the device was an absolute failure and they attempted to put something in its place that would do the work.

Mr. Blakeslee: What device are you now referring to?

A. The by-pass on the first installation, on the Girard, the by-pass on the installation of the Knight. No by-pass in connection with the other at all.

San Francisco, Feby. 19, 1915.

CHARLES B. SESSIONS, a witness produced on behalf of complainant, being first duly sworn according to law, testified as follows:

DIRECT EXAMINATION.

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and occupation.

A. Charles Benjamin Sessions; age, sixty-three; residence, San Francisco, California; occupation, lawyer.

Q. 2. Have you at any time engaged in other pursuits or business than the practice of law?

A. Yes, sir.

Q. 3. In what industry or line of work?

A. I was manager of the Electrical Engineering Company and the Girard Water Wheel Company.

Q. 4. What years would embrace the period of time when you occupied these positions?

A. The Engineering Company I think from about 1892 to 1896 or 1897, and the Girard Water Wheel Company from probably 1895 to 1896 or seven.

Q. 5. Where were these concerns located?

A. On the west side of Main Street, San Francisco, California, between Market and Mission.

Q. 6. They were California corporations, were they?

A. Yes, sir.

Q. 7. What if any interrelations existed at the time mentioned between these corporations?

A. The Electrical Engineering Company did all of the work in constructing the wheels for the Girard Water Wheel Company.

Q. 8. And the Girard Water Wheel Company took orders for such apparatus, did it?

A. Yes.

Q. 9. Did water-wheel devices constitute the sole or principal business of the Girard Water Wheel Company?

A. Yes, sir.

Q. 10. What was the general business of the Electrical Engineering Company?

A. Making motors and dynamos for power purposes.

Q. 11. Did you know of a certain installation of water wheels furnished to a corporation known as the Power Development Company, and installed by or for it in the Kern River Canyon, some 16 miles east of Bakersfield, Kern County, California?

A. Yes.

Q. 12. Do you know when that installation was made?

A. I have forgotten whether it was 1896 or '97.

Q. 13. One of those years, was it?

A. Yes, sir.

Q. 14. By whom if you know, was the water-wheel apparatus furnished to the Power Development Company, and in what manner?

A. It was furnished by the Girard Water Wheel Company, constructed by the Engineering Company?

Q. 15. The Electrical Engineering Company?

A. Yes, sir.

Q. 16. Who was general manager of those companies at that time?

A. I was.

Q. 17. Under whose direct supervision was this water-wheel apparatus constructed?

A. B. C. Van Emon.

Q. 18. What was his position?

A. He was foreman of the Electrical Engineering Company and the Girard Water Wheel Company.

Q. 19. Did you or your company have any dealings directly with the Power Development Company in connection with this apparatus?

A. Yes.

Q. 20. With whom did you deal as representing those interests?

A. Carroll N. Beal.

Q. 21. What was his office at that time?

A. I don't know in what official capacity he acted. I have forgotten.

Q. 22. Whom did he represent?

A. The Power Development Company.

Q. 23. Where was he or his office located?

A. I don't know whether he had an office in San Francisco at that time or not.

Q. 24. Do you know where he is at the present time?

A. No.

Q. 25. Have you any recollection approximately of the contract or purchase price at which the apparatus was furnished?

A. My recollection is that it was \$5500.

Q. 26. Was that the original estimated cost price?

Mr. Westall: I object to this line of questioning as calling for secondary evidence, no foundation having been laid, and also as incompetent, irrelevant and immaterial and not proper rebuttal.

A. That was the original purchase price.

Q. 27. By Mr. Blakeslee: Was that the final and ultimate cost to the Girard Water Wheel Company and

the Electrical Engineering Company for the manufacture, installation and tuning up of this apparatus?

Mr. Westall: The same objection is repeated. It is now nearly seventeen years since this contract was entered into, and the witness is called upon to give his recollection of the provisions of a written contract without any foundation having been laid. We also object to the evidence as irrelevant, immaterial, incompetent and not proper rebuttal.

Mr. Blakeslee: We are not dealing with the terms of the contract, but actual matters involving cash.

A. It might facilitate matters if you let me explain, without putting it in the record. The foreman estimated that those wheels would cost us \$3300. The original estimate of the cost of the wheels to the Girard Water Wheel Company made by the foreman was about \$3300 and the purchase price or sale price was to be \$5500. As a matter of fact, before we were through with it, they cost us a great deal more than \$5500.

Q. 28. By Mr. Blakeslee: How much more, approximately?

A. They must have cost as much as \$7,000.

Q. 29. What produced this extra cost?

A. Inability to figure correctly.

Q. 30. In what respects did the figuring and calculations go astray?

Mr. Westall: All these questions are objected to as entirely incompetent, irrelevant and immaterial.

A. Figuring the shop time it would take to construct those wheels and the amount of metal that was to go into them, the freight, and the amount of time that

would be required to adjust them down at the plant in Kern County.

Q. 31. By Mr. Blakeslee: Were charges made to your knowledge to the Electrical Engineering Company and the Girard Water Wheel Company, or both, for such adjustment or regulation or experimentation upon this apparatus after it had been shipped to the Power Development Company point of installation?

Mr. Westall: The same objection.

A. Yes, sir; to the best of my recollection.

Mr. Westall: It is pointed out that the cost of this apparatus and any mistakes there might have been made in estimating the price cannot in any way affect the issues in this case.

Q. 32. By Mr. Blakeslee: Do you know of your own knowledge who did any of this experimenting with this apparatus after it was shipped to the Power Development Company's plant site?

A. Van Emon, Berry, and I think Cobb.

Q. 33. And by whom was the cost of such experimental work borne?

Mr. Westall: The same objection.

A. It was borne by the Electrical Engineering Company.

Q. 34. By Mr. Blakeslee: What was the final upshot of such experimental work and the attempted operation of the apparatus at the site of the Power Development Company?

A. We lost.

Q. 35. In what respect?

A. Failure.

Q. 36. What became of the apparatus?

A. I don't know. I think it was thrown out. It was never taken away by us. We never took it away to my knowledge. We never took it away as long as I was connected with the Engineering Company or the Girard Water Wheel Company.

Q. 37. Did you ever visit that plant?

A. No.

Q. 38. Then you don't know of your own personal knowledge what final disposition was made of this apparatus after it was delivered and attempted to be operated?

A. No.

Q. 39. Can you state briefly the chief elements of that apparatus or features of it, without going into details?

A. In what respect? The regulation of it, or what?

Q. 40. What was delivered, grouping the general features of the installation into classifications of work.

A. The Girard water-wheel with the casing, the foundation and the regulating apparatus. .

Q. 41. Do you remember what the regulating apparatus controlled?

A. My recollection is that the regulation apparatus consisted of valves which, when the load was thrown off or the load slackened up, and the wheels would exercise a tendency to speed, that the water would be diverted from the wheels into the waste; and that when the load was thrown on or increased, and there was a tendency for the wheels to slow down, that the water would be re-diverted to the wheels.

Q. 42. So that there was a relief control by a valve under the control of this governor. Is that it?

A. That is my understanding.

Q. 43. Do you know whether this governor had been at any time before used in the attempt to govern any other kind of apparatus?

Mr. Westall: Objected to as not proper rebuttal, incompetent, irrelevant and immaterial, and cannot possibly be in rebuttal of any evidence that has been introduced on behalf of the defendant, and, therefore, irrelevant.

A. Yes; I think the principle involved in this regulator was used in the regulation of what we call constant current electric motors.

Q. 44. By Mr. Blakeslee: Regulation of the brushes of such motors?

A. Yes, sir.

Q. 45. By shifting?

A. Yes, sir.

Q. 46. What was relatively the extent of the work imposed upon the governor in that case as compared with the work imposed upon it in the Power Development Company installation?

Mr. Westall: Objected to for the reasons above stated, and for the further reason that the witness has disclaimed any knowledge of the mechanical details sufficient to give an answer which could be of any weight in this case. He has not been qualified to testify as an expert as to mechanical construction and as to comparative effects that might have been produced by the operation of the principle. It is also suggested that this case involves an apparatus, and not a mechanical principle, and that, therefore, the question is vague and indefinite.

A. The regulation of the electric motor was accom-

plyished by this method: When the load was thrown off or loosened on the motor the brushes moved to a lower point of potential on the commutator, and prevented the motor from speeding up, in proportion to the throwing off of the load; and when the load was thrown on the motor the brushes would move up toward the point of high potential and would have a tendency to cause the motor to speed up or take the load. That was the same principle, I believe, that was used in the Girard water wheel.

Q. 47. By Mr. Blakeslee: In which case was the work the hardest for the governor, if either?

A. Well, I don't know that it was harder in one case than in another. The idea is this: If the load was always the same on the electric motor the brushes remained stationary at a certain point. But if you vary that load by increasing it, the brushes would move up according to the variation of the load to the point of highest potential. But if the load was taken out, the brushes would move down to the point of low potential.

Mr. Westall: Counsel for defendant moves that the answer be stricken out and withheld from consideration for the reason that the witness is called upon to give opinion evidence as to the operation and construction of mechanical devices, without having been shown to be qualified to testify as an expert.

Mr. Blakeslee: The ground of the motion appears to be foolish. The witness has been asked questions of fact and not of opinion.

Q. 48. Did the governor in this case do anything more than merely shift the brushes or brush carriages?

A. That is all.

Q. 49. Was there any relief valve or device, or any-

thing of that sort, installed in connection with the brushes?

A. No.

Q. 50. And how did the action of this Girard governor in connection with the brushes compare with the action in connection with the other parts of the Girard apparatus furnished to the Power Development Company?

Mr. Westall: Objected to for the reasons before noted on the record, and the objection that this evidence is entirely incompetent, irrelevant and immaterial, is repeated and is to be understood as applying to all this line of questioning.

A. In the case of the water wheel, instead of shifting the brushes it shifted the water.

Q. 51. By Mr. Blakeslee: And how successfully did it shift the water?

A. I don't think it did it successfully.

Q. 52. Was it anything more, as a matter of fact, than an absolute failure in that connection?

A. Of course, I have no personal knowledge of that, but my information was at the time from the reports made to me that it was a practical failure.

Q. 53. And those reports came to you from your men, such as Mr. Van Emon, Mr. Berry and also Mr. Cobb?

A. Yes, sir. .

Q. 54. They were the engineers in connection with the work you have previously mentioned?

A. Yes, sir.

Q. 55. You took no steps, did you, that is, your company or companies, to use or take away or further

utilize this Power Development Company apparatus furnished by you and your companies after it was thrown out down at the plant of the Power Development Company?

A. To the best of my knowledge, no.

Q. 56. Why didn't you?

A. Well, the place where the plant was erected was remote. Wagon and railroad freight was expensive. I suppose those were the reasons.

Q. 57. Had it been of any appreciable value it could have been applied in such value as against the loss of some \$4,000 which your companies had made on this contract, could it not?

A. Yes; I suppose so. There was a large amount of metal there that was of considerable value.

Q. 58. Did you continue, that is, your company,—did they continue to manufacture that type of water-wheel apparatus and regulating apparatus after that time?

A. No.

Q. 59. Why not?

A. The company went out of business. The company was practically insolvent.

Q. 60. Due in any part to this failure of this apparatus and the loss on the contract?

A. That was largely a contributing cause.

Q. 61. Do you know whether Mr. Berry or anyone else ever applied for any Letters Patent on this apparatus furnished to the Power Development Company?

Mr. Westall: Objected to on the ground that it is not proper rebuttal testimony, incompetent, irrelevant and immaterial.

A. No; I do not.

Q. 62. By Mr. Blakeslee: Did you ever hear that he did?

Mr. Westall: The same objection.

A. I never heard.

Q. 63. By Mr. Blakeslee: During the construction of this Power Development Company contract apparatus did you or did you not keep in touch with its manufacture?

A. Yes, sir.

Q. 64. Did you visit the shop where it was being made?

A. Yes, sir.

Q. 65. And familiarize yourself generally with its development?

A. Yes, sir.

Q. 66. I show you a number of cuts and blueprints and ask you whether they suggest anything to you in connection with any of the apparatus which you know or have had knowledge of?

A. Yes, sir. These blueprints which you show me, to the best of my recollection are blueprints and drawings made for the Girard water wheel or water wheels that were installed in Kern County.

Q. 67. In other words, in a general way they depict the apparatus you have told us about, furnished to the Power Development Company?

A. Yes, sir; in a general way.

Mr. Blakeslee: Let it be shown on the record that the witness has referred to "Defendant's Exhibit Cobb Blueprint No. 1," and "Defendant's Exhibit Berry Blueprint No. 1."

Q. 68. Had you thought it possible to utilize this Power Development Company apparatus after it was thrown out, on any other water-wheel apparatus contract, would you not have made arrangements to salvage the same?

A. I was not in a position at the time to do that, for the reason that my relations with the Electrical Engineering Company were severed and the Electrical Engineering Company brought suit and attached all of the property belonging to the Girard Water Wheel Company. When I say "all of the property", I mean all of the property here. I don't think they attached anything down there.

Q. 69. Do you remember whether or not in connection with the winding up of the affairs of the Girard Water Wheel Company any of the blueprints or drawings or other shop records of this Power Development Company apparatus or type of apparatus was turned over to Mr. Berry, the engineer you have told us about?

Mr. Westall: Objected to as leading and suggestive.

A. Berry brought suit for his salary and attached all the drawings and blueprints.

Q. 70. By Mr. Blakeslee: And what finally became of them?

A. They were sold and he bought them.

Mr. Blakeslee: That is all.

CROSS-EXAMINATION.

By Mr. Westall:

XQ. 71. You have never had any special mechanical, hydraulic or electrical training or education which

would fit you to describe with any degree of precision a mechanical or electrical device which you may have seen?

Mr. Blakeslee: Objected to as irrelevant, immaterial, incompetent and not cross-examination, and uselessly incumbering the record. The witness has testified purely with relation to his experience, knowledge and facts and not as an expert.

A. No.

XQ. 72. By Mr. Westall: Then any knowledge that you acquired and about which you have testified as to the use and operation of the devices which you have pointed out as having been illustrated in "Defendant's Exhibit Cobb Blueprint No. 1," and "Defendant's Exhibit Berry Blueprint No. 1," was merely a superficial knowledge acquired largely by hearsay and not acquired by any careful analysis or examination of any of the devices installed. Is that correct?

Mr. Blakeslee: Objected to as merely argumentative, calling for a conclusion, not the proper method of proof, not cross-examination, irrelevant, immaterial and incompetent.

A. I will say this: I have no mechanical experience at all and could not pass upon any mechanical device. The knowledge I gained of those things was through an observation of the things in the shop that we constructed and conversations with the foreman. I had a pretty fair theoretical knowledge of electrical matters, but no mechanical knowledge.

XQ. 73. By Mr. Westall: You have testified that the apparatus installed by the Girard Water Wheel Company was a failure, and that it was taken out and

discarded. But you would not attempt to specifically point out the mechanical reasons for that failure, nor would you attempt to describe the parts of the devices which were found to be inefficient?

Mr. Blakeslee: The same objection.

A. No.

XQ. 74. By Mr. Westall: Have you been on friendly terms with Mr. Cobb since that time?

A. Oh, yes.

XQ. 75. Are you still on friendly relations with him?

A. Yes. I have not seen him for many years.

XQ. 76. And with Mr. Berry?

A. Yes.

XQ. 77. Have you seen Mr. Berry recently?

A. No; it has been a year or two.

XQ. 78. And with Mr. Van Emon?

A. No. Our relations have not been friendly.

XQ. 79. If Mr. Cobb and Mr. Van Emon and Mr. Berry, being those who were in charge of the mechanical work, were all to testify unanimously that the reasons for taking out this apparatus was because of inefficiency of the water wheel, would you be inclined to believe that they knew what they were talking about?

Mr. Blakeslee: Objected to as merely hypothetical, not the proper method of proof and not cross-examination.

A. Yes.

XQ. 80. By Mr. Westall: And you would not attempt to dispute any of their conclusions as to the exact mechanical causes of the failure?

Mr. Blakeslee: The same objection.

A. No.

XQ. 81. By Mr. Westall: Do you believe that Mr. Cobb is competent after his examination and experience at the plant and after the failure to give the reasons for that failure?

~~A. I have finished.~~

A. Yes; I think he is competent.

Mr. Blakeslee: The same objection.

XQ. 82. By Mr. Westall: Now, the reason that any of the devices which were discarded by the Power Development Company was not taken back and utilized by the Girard Water Wheel Company was on account of the great expense of moving such devices from such a destination, was it not?

A. Yes, I think so.

XQ. 83. And the cost of transportation as well as the labor of taking out those devices would probably have been of great weight as a determining factor as to whether or not they should be attempted to be saved?

A. Yes.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION.

By Mr. Blakeslee:

RDQ. 84. How much do you suppose it did cost to transport this apparatus to the Power Development Company plant and put it inside of the house?

Mr. Westall: Objected to as calling for a mere supposition.

A. I think before we were through with it it cost over \$7,000.

RDQ. 85. By Mr. Blakeslee: I mean the actual cost of transportation and putting it on its foundation down there.

A. I think the railroad freight was something like \$450, and the wagon freight was I don't know what, and installing it I don't know what that was. It required a number of men for a long time.

RDQ. 86. Did it cost over a thousand dollars to put it on its base?

A. It must have.

RDQ. 87. How much more?

A. I don't know.

RDQ. 88. Did it cost half of the entire cost price?

A. I really could not say. You know there was a suit brought against the bondsmen of the Girard Water Wheel Company on account of the inefficiency of those wheel.

RDQ. 89. And you or your companies figured that if those wheels were brought here it would be bringing back just so much junk. Is that correct?

A. I believe that was the impression at that time.

RDQ. 90. Now, in your last answer in which you referred to inefficiency of the wheels, did you refer to the wheels per se, or the entire apparatus as furnished on the order?

Mr. Westall: Objected to as being a very specific statement by the witness. He has stated that it was the inefficiency of the wheel.

Mr. Blakeslee: He can adhere to his statement if he wants to. That is why I asked the question.

Mr. Westall: And he has also said that he is incompetent to pass upon the precise reasons.

A. I must explain to you the point on which the suit went off. The plaintiffs in that case tried to establish that the wheels did not come up to the guaranteed efficiency of the contract and it developed in the case that so much power was to be delivered to the wheel, and they had no method of measuring the loss of the water after it left the standpipe to the smaller pipes delivering it to the wheels. It could not be determined just exactly how much power was delivered to the buckets of the wheels. They could measure the amount of water or the amount of power at the standpipe, but they had no method of measuring beyond that, and for that reason the plaintiffs lost their case.

RDQ. 91. By Mr. Blakeslee: In other words, the plaintiff failed to sustain its contention in this suit that the wheels were not of the guaranteed efficiency, and that was the finding of the court. Is that correct?

A. I think that is right.

Mr. Blakeslee: That is all.

CARROLL N. BEAL, a witness produced on behalf of complainant, being first duly sworn according to law. to testify the truth, the whole truth and nothing but the truth, testified in rebuttal as follows:

DIRECT EXAMINATION.

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and occupation.

A. Carroll N. Beal; residence, San Francisco, California; age, sixty-four; occupation, attorney-at-law.

Q. 2. Have you always followed the occupation of

attorney-at-law solely, or have you been interested in other matters?

A. Well, not for the record I am not occupying myself much as an attorney-at-law just now.

Q. 3. Have you at other times given attention to any other line?

A. I have had considerable training in mechanical engineering and general civil engineering work.

Q. 4. Have you taken academic study?

A. None.

Q. 5. What was the cause of your study?

A. Primarily, the necessity for finding things out.

Q. 6. When did that commence?

A. Several years ago.

Q. 7. Did you utilize your studies?

A. Yes, sir; I did considerable engineering construction work.

Q. 8. In what general line?

A. Electric, hydraulic and railroad.

Q. 9. Can you mention the names of any interest or company with which you were connected for the last thirty years in which you utilized such information?

A. In which particular line?

Q. 10. Hydraulic and electric.

A. The hydraulic and electric work of the Power Development Company, Bakersfield, and hydraulic work for the Bay Cities Company and the Sierra Water Supply Company of San Francisco.

Q. 11. Were the last two instances before or after the Power Development Company?

A. Subsequent to it.

Q. 12. When did the Power Development Company experience commence?

A. My recollection is that that was in 1895 or six.

Q. 13. What was your connection with these matters?

A. I was chief engineer of the Power Development Company and general manager of its business.

Q. 14. Where were you located?

A. My headquarters were in San Francisco; my activities were largely in Bakersfield.

Q. 15. Where was the property or plant of the company located?

A. On the Kern River about 15 miles northeast of Bakersfield.

Q. 16. Do you remember when the installation was put in?

A. No, I do not, without reference to dates. I think the plant was started up along in 1897. I am not a great chronologist.

Q. 17. You were never connected with any other concern or plant of those names?

A. No; not of those names. I have been connected with a dozen different electric plants at one time or another.

Q. 18. Do you know who erected the buildings for that plant and had actual charge of the work?

A. James F. Dearth was superintendent.

Q. 19. Where does he reside?

A. Bakersfield, I think.

Q. 20. Did he ever do anything else in connection with the property of that company?

A. He was the general superintendent, and had man-

agement and oversight of all of the mechanical activities on the Kern River Canyon where the plant was located.

Q. 21. How long did he hold that position?

A. He began with the inception of the plant and held it till about four years ago.

Q. 22. From whom did he take orders or to whom was he responsible in the Power Development Company for his work as superintendent?

A. To me, primarily.

Q. 23. Did he have anything to do with the original purchase and specification of hydraulic and electrical apparatus installed from time to time at that plant?

A. I think not, except in an advisory way.

Q. 24. Who did have that power?

A. I did.

Q. 25. What sort of services did Mr. Dearth render as superintendent of that company at its plant?

A. He was there looking out for the company's interest in every way, carrying forward the work. The company was doing with its own force the work and he was constantly in touch with the work being done under the contract.

Q. 26. What was the nature of his services with reference to efficiency?

A. First class.

Q. 27. Did you have any complaints to make to him or of him for his services as superintendent?

A. No, sir; none whatever.

Q. 28. And during the time he was superintendent, did or did not the Power Development Company earn a profit in the operation of that plant?

A. Yes. The Power Development Company was profitable, but Mr. Dearth had absolutely nothing to do with that, other than he might have made that profit less by inefficient handling.

Q. 29. Did he make it less in any such way?

A. I have no recollection of anything of that kind.

Q. 30. Aside from the question of capability and performance of duty, have you anything to say with respect to the general reliability, veracity and moral character of Mr. Dearth?

Mr. Westall: Objected to as incompetent, irrelevant and immaterial. There has been no attack made upon the veracity of Mr. Dearth.

A. Mr. Dearth is a high class man in every respect; morally, mentally and mechanically.

Q. 31. By Mr. Blakeslee: Did he or did he not during the period of his experience with this plant and his superintendence of it, display to you any material knowledge with respect to electrical matters concerned in the superintendence of that plant?

A. Mr. Dearth went to the plant with only the general superficial knowledge of electricity that a mechanical man would have. His electrical education he got at that plant; practically all of it.

Q. 32. And did you note from time to time an increase of his fund of information in electrical matters during his connection with that plant?

A. Naturally, yes. He was very much interested in the electrical end of it, and he was of an investigating turn of mind and informed himself to the best of his ability by observation, consultation and so forth.

Q. 33. And his pay was increased, or was it not?

A. I have no recollection how he was paid from time to time.

Mr. Westall: This line of questions is objected to as irrelevant, immaterial and incompetent.

Q. 34. By Mr. Blakeslee: Can you give me the name of anyone else who was connected with Mr. Dearth in the handling of that plant?

A. There was quite a number of men working under orders. He had no assistant superintendent.

Q. 35. Can you give me the names of any of these during the earlier period of operation or attempted operation of the plant?

A. Mr. E. M. Beal was with him during all of the time of construction and for quite a period during the subsequent operation of the plant. I would have to pound my memory a good deal to recall the names of the men about that plant at that time. Mr. Dearth was the man in charge of that plant. My son paid special attention to the electrical end of it, and was infinitely more skillful in that branch than Mr. Dearth ever was.

Q. 36. When did you sever your connection with the Power Development Company?

A. The Power Development Company was subsequently merged in the Power, Transit & Light Company, and continued under that for a number of years; and that company was sold out about six years ago, I think.

Q. 37. To what interests?

A. The San Joaquin Light & Power Company, if that is the name. The Balch-Kerekhoff interests in Los Angeles. I want the reporter to note that I have a strong reservation on dates, I do not pretend to be accurate on dates. I don't want to commit perjury.

Q. 38. Do you know whether that Power Development Company plant is now operated in connection with any other plant in the San Joaquin Valley?

A. Only by rumor.

Q. 39. You were, I understand, then, the manager of this Power Development Company from its inception until its dissolution or merger with the Power, Transit & Light Company?

A. That is true. It was disincorporated and went out of business. The Power Development Company did sell its properties.

Q. 40. Did Mr. Dearth have anything to do with the management or supervision of the affairs of the Power Development Company by direct consultation with the officers and directors of that company?

A. Nobody but myself. The responsibility was entirely to me.

Q. 41. His responsibility was entirely to you?

A. Yes.

Mr. Blakeslee: That is all.

CROSS EXAMINATION

By Mr. Westall:

XQ. 42. When Mr. Dearth was first employed by the company he was a carpenter, was he not?

A. Carpenter and millwright, and operation and working of large machinery.

XQ. 43. He was a sort of a general handy man?

A. He was a high class man and, in my mind, there is a very material distinction between that and a handy man.

XQ. 44. But his principal duties were as superintendent of erection of the buildings?

Mr. Blakeslee: Objected to as indefinite, no time mentioned, and calling for a conclusion.

XQ. 45. By Mr. Westall: I am speaking of when he was first employed by the company, before the installation of the machinery.

A. Before the installation of the machinery Mr. Dearth built across the river which you crossed yesterday or day before a bridge. He built a flume which was superceded by a tunnel. He built the residence building. I mean that was the character of his activities leading up to the installation of the machinery.

XQ. 46. When you speak of a high class mechanic, you do not mean as a man of technical education?

A. Oh, no. There is quite as much difference between that and a mechanical engineer as there is between a mechanic and a handy man.

XQ. 47. So, by the use of the term "high grade mechanic," you mean that he was skillful in the use of tools?

A. Skillful and experienced and a man of sound mechanical ideas.

XQ. 48. Were you acquainted with Mr. Cobb?

A. Very well.

XQ. 49. And with Mr. Berry?

A. I knew Mr. Berry, yes.

XQ. 50. And Mr. Van Emon?

A. Yes, sir.

XQ. 51. Have you been on good terms with those gentlemen?

A. Absolutely nothing ever occurred to mar my relations with any of them.

XQ. 52. And would you be inclined to accept the statements of Mr. Cobb and Mr. Van Emon and Mr. Berry as to the causes of failure of any part of the apparatus in the plant at Bakersfield?

A. As far as the integrity of the statement, I would accept it without question.

XQ. 53. And you believe that the gentlemen I have mentioned, after their experience at the plant and their connection with the plant, are competent to give an intelligent reason for any defects that might have come to light in the operations?

A. If their reasons coincided with mine, I would agree that it was intelligent. I don't know. I have had a good many fights with all those men on mechanical problems, and I thought I had better ideas than they had, and I seem to have had, as demonstrated by experience at that plant, because I condemned a number of mechanical things incorporated in that plant with the sanction of Mr. Cobb, as a special consulting mechanical engineer, in my interest and the interest of the company, and controversies that I had where he and Mr. Berry and Mr. Van Emon wanted to do certain things, which, according to my construction, the Girard Water Wheel Company were entitled to under their contract, they having guaranteed results only and not the special means for attaining the results, and where I disagreed with them, and their ideas were carried out and failed. So I make a reservation in that. And yet I think they are high class men, all of them; but some of them are sometimes mistaken. I can prove that by Mr. Henry. He is a high class man.

XQ. 54. Did you have supervision over Mr. Cobb and Mr. Berry?

A. Mr. Cobb reported to me; Mr. Berry did not.

XQ. 55. And any differences of opinion between yourself and Mr. Cobb would be finally decided by you?

A. Yes, in a matter that I had absolute control of. But in a matter of contract where results were guaranteed, the final decision rested with the contractor. Mr. Berry was allied to the contractor, as also was Mr. Van Emon. Cobb was my employee.

XQ. 56. Did you have anything to do with the approval of the contracts or the proposals for contracts which were offered by the various companies for the installation?

A. I think I had everything to do with it.

XQ. 57. And you approved the contract with the Girard Water Wheel Company for the installation of its apparatus?

A. I certainly did.

Mr. Westall: That is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

RDQ. 58. I take it you approved this contract before it was executed or attempted to be filled?

A. The solicitation for tenders was made on the basis of accomplishment. The means for accomplishment were left to the bidder.

RDQ. 59. But you approved of the contract?

A. When it was finally put into form. It was first approved by our counsel, and then it was approved by

us after we looked upon it to find out whether we would have a right to expect it to be fulfilled.

RDQ. 60. The apparatus which the Girard Water Wheel Company furnished to the Power Development Company under that contract was subsequently discarded, was it not?

A. Yes, sir; practically all of it. I think parts of it were built into the subsequent installation.

RDQ. 61. Do you know what was done with the parts that were discarded?

A. I haven't any idea. I think they were broken up and sold for scrap iron.

RDQ. 62. And Tuthill and Knight wheels were put in?

A. Tuthill wheels were put in after the Girard wheels were turned down, and subsequently Knight wheels were put in.

RDQ. 63. Do you know whether Mr. Dearth designed the flume you said he put in at that Power Development Company, and the bridge he erected over the creek?

A. No; he did not. My consulting civil engineer was responsible for those designs.

RDQ. 64. And of the bridge too?

A. Yes, sir.

RDQ. 65. How did you find Mr. Dearth's opinions generally as to matters coming within the field of his superintendence of the plant?

A. In what respect?

RDQ. 66. As to their reliability or value.

A. His opinions were always good. They were not technical opinions, and not such an opinion as I would

expect to get from a man whom I was consulting as a specialist.

RECROSS EXAMINATION

By Mr. Westall:

RXQ. 67. The reason the Girard wheel was taken out was because it did not develop the required horse-power? Is that not true?

A. That is one of the reasons; yes.

RXQ. 68. And there was some error in calculation, was there not, as to the amount of horse-power, or the kind of a wheel that would develop that horse-power?

A. I hardly know how to answer that—

Mr. Blakeslee: Objected to as indefinite.

A. We took several means from time to time—and which installation it was applied to I cannot tell—to determine the amount of power that was being developed, and also the amount of water that was being used to develop that amount of power. There was more or less conflict in those things, and some variation in the calculations. I think what you refer to is controversies between Mr. Cobb and myself in regard to the load as measured by the dynamometer at one time. I disagreed with Mr. Cobb very radically upon his process that he followed to determine the results of the forces. We were a long, long, long way apart. And finally I submitted it to a consulting engineer in New York.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

RDQ. 69. After the Girard wheels or apparatus

were discarded at the Power Development Company plant and the Tuthill wheels had also been discarded, is it, or is it not true, that a system of hand control was installed at this plant for regulating the water wheels?

A. Yes, sir; but the automatic control was not at the same time abandoned. It was also left in place.

RDQ. 70. But the hand control superseded it in the regulation of the plant?

A. I think we used the hand control largely. Mr. Dearth's recollection of that would be infinitely better than mine as to when one succeeded the other.

RDQ. 71. And you don't know whether all the automatic control features or part of them were retained?

A. No, sir.

RE CROSS EXAMINATION

By Mr. Westall:

RXQ. 72. When the Girard wheel was taken out and a wheel called the Tuthill wheel was put in?

A. Yes, sir.

RXQ. 73. And the Tuthill wheel having a different method of regulating the speed could not utilize in full the means that had been adopted for use of the Girard wheel previously?

A. That raises the question of chronology in my mind. I don't know.

RXQ. 74. I am assuming that the Tuthill wheel followed the Girard wheel.

A. There is no question of that in my mind at all. That was the order of installation. Girard, Tuthill, Knight. That was the order of installation. That I am very confident of. When the Tuthill wheel was put in

I do not have in my mind a definite recollection of the regulation means that were applied to it. We never attempted to work that problem out with the Tuthill wheel to its finality for the reason that the wheel did not give the power.

RXQ. 75. And the main reason for discarding the Girard wheel was that it would not give the power?

Mr. Blakeslee: Objected to as calling for a conclusion and not the proper method of proof, and calling for an opinion of the witness.

A. The Girard wheel would not give the power; that was the main reason. And in the low outputs regulated. In the higher outputs of its capacity it did not regulate. I want to say this, as I recall the thing, and that is, *that* owing to the inability of both the Girard wheel and the Tuthill wheel to give the necessary required output, the governing system of those was not tried out as thoroughly as it otherwise would have been.

RXQ. 76. By Mr. Westall: That is the Girard and Tuthill?

A. Both. The fine governing features were not tried out as they would have been tried out had the power output been there.

RXQ. 77. So that the failures of the wheels to give the required efficiency was the main and primary cause of their being discarded?

Mr. Blakeslee: Objected to as calling for a conclusion and not a proper method of proof.

A. If you don't get the power it don't make any difference how well they are regulated. Power was the primary sine qua non. Regulation was to follow.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

RDQ. 78. You got sufficient power and efficiency by the use of the final Knight wheels, did you not?

A. We did not get what we started out to get, but we got what we thought was best under the conditions.

RDQ. 79. Those wheels were not superseded by any others in the plant?

A. Not during my connection.

RDQ. 80. Do you know whether an attempt was made to use any governing apparatus in connection with the regulation of the Knight wheels?

A. Yes, sir. I designed that governor myself.

RDQ. 81. And what was the result of its attempted use?

A. It was fair; not high class, but fair.

RDQ. 82. What did the governor do?

A. It deflected the water.

RDQ. 83. Was there a by-pass device installed in connection with it and attempted to be operated for relieving the penstock?

A. I think not. I am not certain on that point.

RDQ. 84. Prior to the installation of your deflector device do you know whether or not the Knight people put in a nozzle-block construction that was attempted to be operated by a governor conjointly with the by-pass?

A. The governing installation installed by the Knight people consisted of a butterfly valve operated by a worm gear, and I am not able to say whether any of the water was deflected from the supply-pipe by that or not. My recollection is that it was not.

RDQ. 85. Have you any recollection of Mr. Cobb attempting to operate a by-pass in connection with the Knight wheels?

A. I am too hazy to answer that.

RDQ. 86. Now, these butterfly valves that you speak of in connection with the use of the Knight wheels, were in the pipe-line or supply-pipes controlling the flow of the water to the wheels?

A. Leading up to the nozzle block.

RDQ. 87. Those were worked by hand, were they not?

A. Yes, sir; there was but one in each supply-pipe, and it was worked by hand through a worm-gear device.

RDQ. 88. And that was prior to your building the deflecting device?

A. The deflecting device was after the knight wheel was accepted. The contract with Knight did not call for anything but the hand government which he installed, and subsequently we put in the deflector plates.

RDQ. 89. And before you put in the deflecting device there were slide valves on the nozzle blocks? That is, with the Knight wheels?

A. I don't think so.

RDQ. 90. You don't remember what was there?

A. I don't think there was anything there except the ports.

RDQ. 91. But subsequently and after the attempted use of your deflectors hand control was resorted to?

A. The deflectors were installed and operated with the wheel, and then a system of control of the wheels was put in by Mr. A. M. Hunt, by which it could be operated from the switch-board.

RDQ. 92. By means of a butterfly valve?

A. I won't say about that. There was a cut-off or cylinder valve in that supply-pipe. I don't know whether they used the butterfly valve or that cylinder.

RDQ. 93. However, it was purely a hand control?

A. The governing device ~~which~~^{that} I put there was for trial and was not regarded as adequate without hand control, and the Knight hand control was superseded by Hunt's installation.

RDQ. 94. And that was hand controlled through the feed pipes?

A. Yes; but whether it operated through a butterfly valve or through this hydraulic cylinder, I don't know.

RECROSS EXAMINATION

By Mr. Westall:

RXQ. 95. When did you sever your connection with this company?

A. About six years ago.

RXQ. 96. Up to the time you severed your connection they had had no form of purely automatic government?

A. None that was successful.

RXQ. 97. There were many successful governing devices on the market prior to the time you severed your connection with the company, were there not?

A. So claimed by the manufacturers.

RXQ. 98. But you did not believe that any of those governors would be—

A. (Interrupting) I do not see that any of the conventional or standard makes were applicable to our conditions.

RXQ. 99. Did you believe that you had a specially hard set of conditions to meet with which would more than tax the capacity of the forms of governors that were then on the market?

A. No; it was not our natural conditions. It was the condition resultant upon putting in one installation and then remodeling it for the second one, and then again for the third one, that created a installation the like of which was never contemplated by anybody originally who would be designing a governor for the purpose of meeting the requirement of a standard installation. We did not have a standard installation.

RXQ. 100. And it was that anomalous condition that kept you from installing a more modern form of governor?

A. I don't know whether I ought to answer yes or no to that. There was not any more modern form of governor than the one I put in. It was the first and only one of its kind. It was the most modern thing there was at that moment. There were a number of governors manufactured by various manufacturing concerns like the Lombard, for instance, but on inspection of those I did not see that they could be economically applied to our conditions. Hence the special designs.

RXQ. 101. You were paying something like \$180 or \$200 a month for extra help to take care of the manually-operated governor, were you not, which you would have saved if you had put in one of these automatic governors?

A. We were paying a certain charge per month for hand work that, if it had been done automatically, would

have been saved, less the fixed charge against the automatic machinery.

RXQ. 102. And did you believe it would be more economical to pay that extra money, that is, up to the time that you severed your connection with the company, than to install ~~all~~ the modern improvements in governing apparatus that had been made at that time?

A. I doubted the wisdom of making such an installation, because I doubted the applicability of any of those modern governing mechanisms that you refer to, to our conditions.

RXQ. 103. Could you briefly describe what those peculiar conditions were which made you doubt the availability of those governors?

A. I don't think I could give any intelligent idea. We started in with the Girard Water Wheel Company. The Girard water wheel failed to meet the requirements, and those conditions laid out by its engineers fitted exactly to its designs were then availed of in the highest possible degree in the succeeding installation—in the Tuthill installation and the same thing with the Knight wheels. Our installation was far from standard, and so far as I could discover, there was no governing device on the market that would go in without abnormal cost.

RXQ. 104. That is, in the way of re-assembling or re-arranging the machinery?

A. Call it rebuilding it, if you please. In other words, if you put in a governor of standard type at that time, it was substantially made for an entire new water-wheel installation.

RXQ. 105. And your opinion was that the cost of putting in that new installation would far exceed the cost

of paying the extra amount to these employees who operated the hand control?

A. My judgment was that it was not an economical thing to do.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

RDQ. 106. In other words, I take it that you purchased in the beginning of this Power Development Company plant, an installation that was built for the use of a certain governor in connection with certain features of control of the supply of water to the wheel, and certain features providing for relief of pressures in the pipe-line by the attempted use of a by-pass, and that the plant so originally organized, when you found these features were not operative and were thrown out, could not be adapted to the use of another governor without entirely reorganizing the installation with the object in view of putting in such other governor. Is that a fair statement?

Mr. Westall: Objected to for the reason that it does not correctly state anything the witness has testified to. The witness has not testified that the particular features that have been mentioned were not operative.

Mr. Blakeslee: Let the witness state whether that is a fair summary of his testimony.

A. Let me give you a brief resume as it occurs to me. We specified conditions and requirements with respect to the power output and the governor. The Girard Water Wheel Company accepted the responsibility of complying with those requirements, the design being left entirely to them except it was to occupy a given space. In all

other respects the design was entirely their own. We had nothing to do with it. The only thing that we had to say with regard to the Girard Water Wheel Company was that it must not encroach upon certain spaces allotted to our machinery, and that its mechanical sufficiency must meet with our approval. Its efficiency and power output was fixed by the contract. Pursuing this contract, the Girard Company put in a certain installation which failed for reasons previously stated. What was then there on the ground was taken and availed of as was thought possible to accomplish the installation of the Tuthill wheels which again failed, the same requirements having to be met. And then what was available of the two former installations was availed of to whatever degree was found possible in the Knight installation.

RDQ. 107. In other words, you proceeded by a sort of a metamorphosis, from Girard to Tuthill and from Tuthill to Knight, working over what you had as best you could. And had you attempted to install another form of automatic governor or an operative form of governor, it would have been necessary to entirely reorganize the installation to provide for such governor. Is that correct?

A. It would have been necessary to modify it very materially in order to make it adaptable to the operation of what was regarded as the standard type of governors.

RDQ. 108. Then could you have known, and for all practical considerations, the failure of the attempted automatic governor originally installed by the Girard people meant failure of that plant in so far as governing was concerned? Is that correct?

Mr. Westall: Objected to as erroneously quoting the

testimony of the witness and assuming facts that have not been shown.

A. My recollection of the Girard governor is that within certain compasses it operated fairly well.

RDQ. 109. By Mr. Blakeslee: But when that apparatus was discarded it marked the finality with respect to attempts to automatically govern that plant?

A. No; that is not true. Because after the Knight wheel was put in the deflecting plates put in it were still actuated by the dynamometric part of the original Girard installation.

RDQ. 110. But there was no successful operation of any by-passing device?

A. As I have stated, my recollection of the chronology of the by-pass devices is not accurate enough to be of value to either of you.

RDQ. 111. But what ultimately occurred was that hand control was resorted to in that plant?

A. In my connection with it, up to the time that I ceased to have any active connection, the automatic governing device in the Knight wheel was still in position.

RDQ. 112. But was not automatically governed?

A. The automatic governing of the plant was supplemented by a hand device, or either of them could be thrown out of commission and the other relied on alone. But we did not feel safe in relying on the automatic governor.

RDQ. 113. And there was no by-pass device in that governing at that time?

A. I will not make any statement about that. Mr. Dearth's chronology ought to be accurate.

RDQ. 114. At the time you severed your connection

with the company there was no such by-pass in operation?

A. I think not. I think it was finally abandoned.

RDQ. 115. You did not design any by-pass device for the Knight wheel installation, did you?

A. No.

RDQ. 116. Then, as I understand it, this overhead charge of approximately \$200 a month for extra assistance utilized in operating the hand control at the Power Development Company's plant was made necessary or caused by the fact that there never had been in this plant an automatic governor which had qualified to continuously control that plant?

A. There never was an automatic governor in the plant that justified the abandonment of the means for hand control.

RDQ. 117. And in the metamorphosis of this plant from Girard to Tuthill and from Tuthill to Knight you discarded what you felt could not be availed of or incorporated in future installations. Is that correct?

A. Yes; our arrangements with the contractors subsequent to the Girard wheel, were, "there is the plant; avail yourself of what you can, and put in a plant with the guaranty."

RDQ. 118. What was done with the parts of the plant thrown out?

A. Scrapped.

Mr. Blakeslee: That is all.

Feby. 19, 1915, P. M.

RUDOLPH W. VAN NORDEN, a witness produced on behalf of complainant, being first duly sworn accord-

ing to law to testify the truth, the whole truth and nothing but the truth, testified in rebuttal as follows:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and occupation.

A. Rudolph W. Van Norden; occupation, consulting engineer; age, thirty-nine years; residence, San Francisco, California, and place of business, San Francisco, California.

Q. 2. In what lines have you engaged as consulting engineer?

A. Principally in hydro-electric work and hydro-electric installations and designs.

Q. 3. What training, briefly stated, have you had in preparation for such consulting engineering?

A. I am a graduate of Stanford University and my experience covers about twenty years in this work.

Q. 4. Graduating in electrical engineering?

A. Mechanical engineering.

Q. 5. And you studied electrical engineering in addition?

A. Yes, sir. I might say I am a fellow of the American Institute of Electrical Engineers, first grade, and a member of the American Society of Civil Engineers.

Q. 6. Do you know of a light and power corporation in the state of California having the name of the San Joaquin Light & Power Company?

A. Light & Power Corporation; yes, sir. I am quite familiar with it.

Q. 7. Have you visited any of their stations?

A. All of them, with the exception of an abandoned station on the Merced River.

Q. 8. In what connection did you happen to visit them?

A. I visited their stations in order to write up a technical description of their entire system.

Q. 9. For publication?

A. It was for publication, ostensibly, but in reality for distribution among their bond holders, so they could sell bonds.

Q. 10. When did you visit the stations of the San Joaquin Company?

A. I don't remember just the date, but it was about somewhere between the 20th of March and the 5th or 6th of April, 1912.

Q. 11. Will you please mention the names of a few of the stations of this company which you visited at that time?

A. There are three hydraulic stations: San Joaquin No. 1, San Joaquin No. 2, and the Power Development station on the Kern River. I have forgotten the original name of the company, but at that time it was the property of the San Joaquin Light & Power Corporation, so it is a San Joaquin station. Incidentally, I visited the Edison station of the Edison Light & Power Company on the Kern River, and a year later, in December, 1913, I visited the new Tule station of the San Joaquin Light & Power Corporation on the Tule River. That was a year and a half ago.

Q. 12. And what water supplies this Tule station?

A. The north fork of the Tule River.

Q. 13. By means of a reservoir?

A. No; they have no reservoirs as yet.

Q. 14. Do you know of any plant which is known among hydro-electric interests as the Crane Valley plant?

A. That is generally the San Joaquin No. 1 plant, which is the main plant of the San Joaquin Light & Power Corporation, and is generally known as the Crane Valley plant.

Q. 15. You visited that?

A. Yes, sir.

Q. 16. At what time?

A. I have complete photographs. I visited it about—well, it was early in April, 1912. I could give the date and the day by looking at my record.

Q. 17. This Power Development plant you speak of is located where?

A. It is right at the ~~point~~ joint where the canyon of the Kern River ends or comes out of the mountains and comes into more or less rolling country.

Q. 18. In what direction from Bakersfield, Kern County, California?

A. My impression is that it is about east, although I think it is more north of east.

Q. 19. And about how far, approximately?

A. I should say 14 or 15 miles. It is a 40-minute ride in an automobile.

Q. 20. Do I understand that that plant is now controlled or owned by the San Joaquin Light & Power Corporation?

A. That is what I understood at the time I visited it.

Q. 21. Now, as to these several plants of this cor-

poration and, particularly, this Kern River Power Development plant you have mentioned, and the plant you have designated as the Crane Valley plant, have you anything to state as to the system of the distribution of the electric energy in regard to the generation of these plants?

Mr. Westall: Objected to as incompetent, irrelevant, immaterial, not proper rebuttal testimony.

A. The system of distribution is a closed loop in which the Crane Valley feeds into one end. You might say a circle, although it is not a circle in actual form; it is a loop. The so-called Crane Valley plant, or San Joaquin No. 1 and No. 3, feed together in one end of this system. I am speaking of the 60,000-volt distribution which is the high voltage distribution going to Bakersfield. They also feed into a secondary distribution at 33,000-volt, which feeds the country around Fresno in Fresno County and in Madera County and Merced County and up into Mariposa County.

Q. 22. Is the Power Development plant you have so designated hooked up with either of these systems?

A. Yes, sir; it is, through the Bakersfield steam plant.

Q. 23. So that the Crane Valley plant and the Bakersfield Steam plant and the Power Development Company plant are on the same system of distribution, or in series, you might say?

A. They work synchronously.

Q. 24. And that being the case, what have you to state as to the effect upon the generators of these several plants of a change in load on the distribution sys-

tem which these plants are incorporated, irrespective of any governing or regulating apparatus?

Mr. Westall: Objected to as vague and indefinite.

A. I do not quite understand your question.

Q. 25. By Mr. Blakeslee: I will put it this way: All of these several plants being hooked up together on this distribution circuit, will or will not the generators of the several circuits be affected and the apparatus for driving such generators be affected by change of load upon that circuit at any point, irrespective of any governing apparatus?

A. They will be affected in this way: Whichever plant is doing the governing would naturally carry the variation in load. If one plant is doing it.

Q. 26. Let us assume that there was no governing apparatus, and we have not so far developed that there is. With such assumption, what will be the effect upon the generating installation at the several units?

A. If there was no way to control the water and they were running along at a certain load and the load should change, if it should increase, the generators would naturally slow down and not carry the load all over the system. If it should decrease, the generators will speed up and tend to more than carry the load.

Q. 27. And in that sense there is a synchronous, sympathetic relation?

A. One station might be connected with a line of so small capacity that the generator at the end of that station would not take this difference in the change of load, or assuming that there is no governing.

Q. 28. But even in that case it would be a matter of degree and there would still be a variation?

A. There would still be a variation.

Q. 29. Is that also true considering the incorporation in that distribution system or circuit of a steam plant at Bakersfield?

A. It is.

Q. 30. Now, as a matter of fact, do you know whether any of these plants in this distribution circuit, including the Power Development station, has any governing apparatus for regulating the generators and the power supplied to the generators of the several stations linked up or linked together in this circuit?

A. I think they are all equipped with governing apparatus, although for the moment I have forgotten what the apparatus is at the Power Development station.

Q. 31. Do you know whether either of those stations have automatic governors?

A. I think they all have, except, as I say, I have forgotten what the machines are at the Power Development Company.

Q. 32. Can you state briefly what the governing apparatus is at the so-called Crane Valley station?

A. It is a Lombard governor; type Q Lombard governor.

Q. 33. And what means connected with such governor is employed for regulating the flow of water to the wheel or wheels?

A. The regulation at the Kern Valley station is different from that at the No. 3 station—the San Joaquin No. 1 station is different from the No. 3—in that they use a by-pass nozzle, whereas they use two needle nozzles, one operating on the wheel and the other acting as

a by-pass. The governor operating these two nozzles operate synchronously.

Q. 34. And what is the relation between the wheel supply and by-pass needle when they are operatively covered?

A. When the governor acts to shut the water off the needle advances in the operating nozzle so as to decrease the size of the opening and cut the water off. And in the same proportion it opens the needle in the by-pass nozzle to let that water by, so that the water that otherwise would go on to the wheel would simply pass by without causing a shock to the piping, or decreasing the speed of the water.

Q. 35. And is the converse true when more water is to be admitted to the wheel or wheels?

A. That is correct.

Q. 36. Then is it correct to state that there is an inverse operation of the wheel supplying needles and the by-pass needle?

Mr. Westall: Objected to as leading and putting words into the witness's mouth, and assuming to read certain language of the patent into the mouth of the witness. I would suggest that he be allowed to select his own words.

A. Yes.

Q. 37. By Mr. Blakeslee: Do you know who furnished these needle-nozzle installations for this so-called Crane Valley plant?

Mr. Westall: Objected to as incompetent, irrelevant and immaterial, and not proper rebuttal.

A. They are Doble machines, and I assume that that they were furnished by the Abner Doble Company.

Q. 38. By Mr. Blakeslee: Do you know when they were furnished?

Mr. Westall: The same objection.

A. I cannot say. Yes, I can, too. They were furnished in 1911.

Q. 39. By Mr. Blakeslee: Please look around the room and see if you find anything which in any respect corresponds to the Lombard governor you have referred to as being connected up with the needles of the installation of this so-called Crane Valley station, or any parts of said Lombard governor.

A. This apparatus before me is what is known as the dashpot, and it is integral with all Lombard governors. (Witness refers to Exhibit W.)

Q. 40. Please state briefly through what parts or features the Lombard governor at this so-called Crane Valley plant exerts its influence or operative effect upon inversely acting needles.

Mr. Westall: The same objection.

A. The needles are operated by a swinging lever. The needles themselves are each mounted on a shaft. The shaft is operated by levers which are connected back to the operating mechanism of the governor, so that when the impulse is given to the main piston which supplies the power in the governor it moves the governor shaft, and through the various links and bell-cranks, moves these needles.

Q. 41. By Mr. Blakeslee: When you speak of shafts, what relation have such shafts to the stems of the needles?

A. I speak of a shaft as a necessary means for con-

veying the power from the governor to the needles as a piece of the mechanism.

Q. 42. I show you blueprints being "Complainant's Exhibit KKK" and "Complainant's Exhibit LL", and ask you to state whether there is any relation between the showing of either of these and the governor and needle installations at the so-called Crane Valley station that you have told us about.

Mr. Westall: All this line of questioning is objected to for the reason before stated, because it is apparently an attempt on the part of counsel to make out his prima facie case on rebuttal.

A. I cannot say whether this is the actual drawing of the Crane Valley installation, but it is similar, and, to my mind, shows the connection between the Lombard governor and the two needles that I have described.

Mr. Blakeslee: Let it be shown that the witness in his last answer points to "Complainant's Exhibit KKK."

A. My reference was to give an intelligent description of the connection between power supplied to the governor and the power supplied to the two needles. That shaft is simply a mechanical connection.

Q. 43. Now, with the provision of this Lombard governor assembled and installed in connection with the inversely operating double needle installations at the so-called Crane Valley station, and with that station synchronously and sympathetically connected up with the station of the Power Development Company which you have referred to at the mouth of the canyon of the Kern River, what will be the effect upon the operation of the generators and wheels at said Power Development Company installation, assuming that there is no such auto-

matic governor at such Power Development Company station?

A. I can answer that by telling you how they were operated at the time I visited it, and, I presume, are still doing. The governing of the system was done principally at the Crane Valley station. A small part was done at the steam plant which was floating on the system. The Power Development Company station was not doing any governing at all. They took a continuous, steady load, without any variation of any kind, and simply operated for a certain number of hours each day, and possibly, continuously. At least, there were a certain number of hours at a steady, continuous load.

Q. 44. And how did the wheels operate at the Power Development Company plant in connection with the carrying of this steady, continuous load?

A. The wheels simply carried a perfectly steady load.

Q. 45. And what was the speed of the wheels in carrying this constant load?

A. It was the proper operating speed of the machine. I do not recollect what it was, but it was, maybe, 300 R. P. M. It was the proper speed of the system.

Q. 46. Had there been no such automatic governor or the Lombard governor device, or the like, installed at the so-called Crane Valley station, and no other such automatic governor or any other governor at any point on the synchronous system, including that station and the station of the Power Development Company, what would have been the effect upon the speed of the wheels at the Power Development Company station incident to changes of load upon that synchronous system?

A. The speed would vary, as I explained before, unless there was hand regulation.

Q. 47. As far as the mere regulation of the Power Development Company plant is concerned, and the maintenance of the proper and constant speed of the wheels at that station, is it, or is it not material whether the governing apparatus be installed directly at the Power Development Company station or be more remotely installed upon the same synchronous circuit as that of the so-called Crane Valley station?

A. In the system as they had it connected there would be absolutely no advantage in having any governing apparatus at the Power Development Company station, because that station being a very small part of the entire output of the system, even if it could govern, it would probably not have governing capacity enough to materially affect the system or properly handle the system.

Q. 48. But, more particularly, is there or is there not any difference in the governing efficiency with respect to the wheel of the Power Development Company plant incident to the more remote installation of the governing apparatus, namely, that at the so-called Crane Valley station, or any difference between such governing effect and the governing effect which would be obtained by providing suitable automatic governing mechanism directly at the Power Development Company plant?

A. My last answer, I think, covers that. In a system of that kind the governing is generally done at the master plant, which is the largest plant.

Q. 49. And in so far as the governing of the Power Development Company plant is concerned, speaking of

its governing for the moment specifically, is it or is it not material, or does it or does it not produce any difference in the governing effect in that the governing apparatus is at a remote point on this synchronous circuit?

A. The governing at the Power Development Company's plant, if it were so used, would not handle the system at all. It would be of little value.

Q. 50. It would not handle the entire system?

A. No; and it would be foolish to attempt to govern at that point.

Q. 51. But the governing, if done directly at the Power Development Company plant, would be efficient up to the capacity of that plant, would it not?

A. Oh, yes, provided it would handle the load, which I don't think it would.

Q. 52. Is or is not that regulation effectively taken care of by the Crane Valley plant?

A. That and the steam plant at Bakersfield.

Q. 53. So as far as the efficiency of the governing of the Power Development Company plant is concerned, no further governing is necessary at that plant?

A. None whatever.

Q. 54. Do you know whether the Bakersfield steam plant is operated at all times? That is, during the peak loads, in that synchronous circuit?

A. I think it is, but I cannot answer the question. At the time I was there I think it was operating at all times.

Q. 55. If at any time it was cut out of the circuit, then the governing of the Power Development Company would be effected entirely by the governing mechanism of the Crane Valley plant, would it not?

A. In all probability.

Q. 56. That would be true unless there was some other governor installed at some other plant on the circuit?

A. It could be governed within certain limits at the Tule plant or the No. 3 plant when they operate. The No. 3 plant operates only six months in the year, and the Tule plant only about six months in the year.

Q. 57. Then it would be advisable and proper commercial performance to govern the Crane Valley plant and the Power Development plant together by the sole governing installation at the Crane Valley plant?

A. Yes, sir.

Q. 58. Is that system or method of governing generally employed upon circuits of this same kind where a number of plants at separate points are tied into a single circuit?

A. It is almost universally done, although in other systems, as in the Pacific Gas & Electric system, the governing is not all done at the same plant. It may be done one day at one plant and another day at another.

Q. 59. But is it done usually at any one time at one of the hooked up plants?

A. Provided that plant has the capacity to handle the variations in the governing.

Q. 60. And the preference is to govern at the master plant or plant having the greatest generating capacity?

A. That is generally the case.

Q. 61. In so far as the governing of the Power Development Company plant by means of a remote governing apparatus at the Crane Valley station is concerned,

is it material from the standpoint of efficiency whether or not the Bakersfield steam plant is included in the synchronous circuit or the circuit bridges such plant?

A. Not unless the call for power on the system is greater than the Crane Valley plant can supply.

Q. 62. Unless it is so extreme that the governing apparatus there could not take care of the system?

A. That is the idea. The object of the steam plant floating on the system is not to govern, but to pick up the load in case of a break in the transmission line so as to cut the other plant off.

Q. 63. Now, what is the practice where there are a number of different plants connected up in the same synchronous circuit and governors are provided at the several respective plants for governing from time to time all of the stations in the entire circuit, as to the choice of the station at which at any one time the governing is performed?

A. That would depend on a good many circumstances.

Q. 64. Will you state some of those, please?

A. If all the plants were in a position to draw on the water, the biggest plant or master plant would probably govern. In the case of the Pacific Gas & Electric Company, different plants have a maximum of water at different times. For instance, the De Sabla plant governs and operates the full load during the evening peak when they start in at dark with a full reservoir. They pull on that reservoir till it is pulled down, taking all the power they can get, and do the governing. As soon as that plant has exhausted itself, the governing is put on the Colgate plant. And the Electra plant is like the De

Sabla plant, and has a period of time when it can operate, before it exhausts the water supply, and when it can govern.

Q. 65. Then the selection of the plant which is to govern is predicted upon the condition of the power-supplying medium at that plant, is it?

A. Yes. Let me qualify that. In the Pacific Gas & Electric system, besides their steam plant they have four large hydro-electric plants, each one of them as large as the Crane Valley plant, so that each one of them is capable of governing, either singly, or, possibly, two of them together. It is entirely possible for two plants to govern the system together.

Q. 66. And now, similarly, when the power-supplying medium is fuel, such as oil, and fluctuations in the cost or value of such fuel occur, are such fluctuations taken into consideration in selecting the governing station?

A. They might be. As a matter of fact, at Bakersfield when I visited there the fuel was gas.

Q. 67. And that is relatively cheap?

A. Relatively cheap.

Q. 68. And by what means is the selection of the governing plant affected, and how is such selection put into effect?

A. In this instance of the Crane Valley plant, they have a limited amount of water, due to their canal system. In the summer time this is further limited when the Crane Valley reservoir gets low. At the plant itself there is a forebay reservoir of considerable capacity. It is advisable for them to save all the water they can in that reservoir, and for that reason it pays them to gov-

ern at that point because, if the load should drop off, they can save their water. At the same time, if the load comes on suddenly, they have the water there to supply the extra power.

Q. 69. And how is the saving of water effected by governing at the station where such saving is desirable?

A. If the station governs and the load goes off, the station immediately governs in consequence and the main needle is closed and by the by-pass needle opens. But immediately the differential device operates, it closes the by-pass needle and saves the water without shock to the pipe-line.

Q. 70. I now show you five sketches on separate sheets of paper, being complainant's exhibits respectively "Wilson's Sketch A, B, C, D and E," and ask you if these sketches indicate anything to you generally by their disclosures, and, if so, what?

A. The first sketch, Sketch A, is the double needle nozzle such as we have been talking about on the San Joaquin No. 1 plant, the operating nozzle and the by-pass nozzle operating synchronously. The sketch is only elementary, of course.

Sketch B is an elementary sketch showing the principle of the gates on the so-called Girard wheel, similar to the one used on the Power Development Company when it first was put in. I will say, though, that that is not a true Girard wheel. The by-pass valve shown here is what would be known as a butterfly valve.

Sketch C indicates the gate mechanism of a so-called Girard wheel of the Power Development plant as originally installed with a by-pass valve which, I suppose, you

would call an unbalanced by-pass valve. It is similar to a service cock.

Sketch D would show a mechanism for a main nozzle and by-pass nozzle for a tangential water wheel, the nozzle being of the old fashioned cylindrical type and having a slide valve so arranged that the one nozzle opens when the other nozzle closes, thus accomplishing the result of by-passing the water out of the lower nozzle.

Sketch E is similar in principle to sketch D, accomplished by a slightly different mechanical arrangement.

Q. 71. How many slide valves are there in Sketch E?

A. Two in Sketch E, which accomplish the same result as the one slide valve in Sketch D.

Q. 72. Are you able in any manner to group the several valves of these five sketches in such manner that they shall be classified or generalized as to their types with respect to action and adaptability to be sensitively and responsively operated by governors?

A. The valves in Sketches D and E are both unbalanced valves. That is, they have pressure on one side of them and not on the other, and they would not have an equal action throughout their movement for the reason that as they open the pressure may or may not become more or less on them, and their action would undoubtedly be very erratic. In fact, they would probably "chatter", and they would certainly wear. There is another point about these valves: The way these sketches show, the valves are opening and closing circular orifices. As they are connected together the variation of decrease in the flow of one would not be proportional to the increase of the other one, on the back side where it is closed

and practically no pressure, for the simple reason that the one is uncovering a circular opening, which has a variation of area, and the other is covering it, which also has a variation of area inversely. That would be synchronous in action but not in operation.

Q. 73. They would not be in direct inverse ratio?

A. No. Neither would they in Sketch D. Sketch C would be an unbalanced valve on account of the pressure on it when it is open.

Q. 74. To which valve are you referring?

A. The by-pass valve.

Q. 75. Also the one you refer to as the service-cock type?

A. Yes, sir. Also the increment in opening or decrease in closing would not be uniform in proportion to the opening or closing of the main valves of the wheel so that the control of the water coming out would not be inversely proportional to the water passing through the wheel. The butterfly type of valve shown in Sketch B is a balanced valve, so that the water pressure on the valve tending to open or close it at any time is practically the same. On Sketch A the needles are practically balanced, so that the effort to open or close would be, if properly designed, very nearly even throughout the stroke.

Q. 76. Did I understand you to say that the type of valve shown roughly in Sketch A corresponds to the type of valve installed at the so-called Crane Valley plant?

A. Yes, sir.

Q. 77. Can you further classify the several valves shown in these five sketches with respect to the friction-

al opposition to governing action during play or movement of the valves?

A. Yes. In my description of the valves C, D and E, when I said they were unbalanced in pressure, of course, there is at times a great frictional resistance.

Q. 78. I mean more particularly the valves and the seats with which they cooperate.

A. There is always frictional resistance.

Q. 79. You mean in these types of C, D and E?

A. Yes.

Q. 80. How about the types in A and B?

A. If properly designed there would be frictional resistance, but it would be practically even throughout the stroke.

Q. 81. Would there be any frictional loss in the types in Sketches A and B, as between the seats on the valves and the valves themselves in the operation of the valves?

A. Only the mechanical friction where they pass through the borings.

Q. 82. But as between the needle members themselves and the seats, would there be any friction in the play on the valves?

A. Nothing that is uneven.

Q. 83. Would there be any such friction in the movements of the valves as between the valves and the seats thereof?

A. You are speaking of this point here?

Q. 84. Yes.

A. Of course, there is a certain friction of the water over the surface.

Q. 85. You mean between the specific surfaces of the valves and their seats—the metallic part?

A. Yes, sir. If this valve is properly designed the thrust of the water on one side should be taken up by the reaction on the other.

Q. 86. But as between the metallic surfaces of these valves in Sketches A and B, is there any friction between the valves and their seats during the movement of the valves?

A. In comparison between the two, there would be practically nothing.

Q. 87. And as to the valves you have pointed out in Sketches C, D and E, that is, the unbalanced valves, is there such friction at any time in the movement of the valves?

A. Very great friction.

Q. 88. How much of the time?

A. It would be practically throughout the movement of the valve, although it would decrease as the valve was opened.

Q. 89. What effect upon such friction has the pressure of water on these valves?

A. It causes friction.

Q. 90. Now, with respect to responsive and sensitive governing, which of these groups of valves, if either, shows a preferable organization?

A. I think that the only one that would be considered in governing would be the one on sheet A.

Q. 91. And as to the one on sheet B and contrasting the same with sheet A, what have you to say?

A. The one on B could be used, so far as friction

goes, but it would not govern the water with the regularity that the one on sheet A would.

Q. 92. The frictional element would be missing?

A. Yes, sir.

Q. 93. Would it or would it not be more advantageous than those on sheets C, D and E?

A. It would be very much more so on B than on C, D and E.

Q. 94. Have you had occasion to put into use or use Lombard governing devices, including the dashpot and attendant features, such as shown in "Complainant's Exhibit W."?

A. I have.

Q. 95. Have you ever installed such Lombard governing devices?

A. I have

Q. 96. In connection with hydro-electric plants?

A. Yes, sir.

Q. 97. Have you ever governed such plants through such governing devices?

A. I have.

Q. 98. That is, giving your attention to the operation thereof?

A. I have.

Q. 99. Have you at any time installed one or more complete hydro-electric plants with such governing devices?

A. Yes, sir.

Q. 100. What has been your general experience for the last ten years or so in the hydro-electric field?

A. I have designed and built hydro-electric plants and systems and operated them.

Q. 101. Can you name some of the companies and stations in connection with which you have done this work?

A. I have designed and built three plants that are now part of the Pacific Gas & Electric system, and the master plant of the Northern California system, and other plants, besides acting as consulting engineer on a number of others.

Q. 102. Are all of these plants using Lombard governors such as those you say you have installed, including features like those of "Complainant's Exhibit W"?

A. Not all of them.

Q. 103. How large a percentage?

A. The Coleman plant of the North California does not use it. They used it on other parts of the system. The Pacific Gas & Electric Company use Lombard governors on all their plants.

Q. 104. How about the other plants?

A. Yes. I have just completed the installation of a Lombard governor.

Q. 105. And the other plants?

A. With the one exception which I mentioned

Q. 106. Does your connection with it go back beyond ten years?

A. Yes, sir; about eighteen years.

Q. 107. I show you a bottle of fluid marked "Complainant's Exhibit Bottle of Kern River Water at Power Development Company Plant," and ask you, from such inspection as you can make, how the physical character of this water compares, generally, with the water of other creeks, rivers and streams in California, used in operating hydro-electric plants with which you have had ex-

perience, particularly as to freedom from solid or semi-solid contents?

A. Well, I have been on the Kern River on two different occasions at different times of the year, and in both instances the water was absolutely clear.

Q. 108. How has your experience with the water as you found it there compared with the water of other streams?

A. There is a great variation in the quality of water of other California rivers during the different parts of the year, but the more northerly rivers have more or less debris and the water is not clear. Take the rivers up to and including the Tuolumne, the water is fairly clear. From there on up you get more or less of the effects of hydraulic mining even today, and the water in the winter time is always yellow, till you get to Shasta.

Q. 109. And is the Tuolumne stream that you speak of substantially in the same latitude as the Kern River?

A. No; the Tuolumne is not always clear.

Q. 110. The same latitude?

A. No, no. It is farther north.

Q. 111. How does the water in this exhibit from your brief examination compare as to clearness or limpidity with the water of other California streams used for hydro-electric plants?

A. Well, it is very much clearer than most of the rivers would be at this particular time of the year.

Q. 112. Do the other plants have any material trouble in utilizing the more cloudy or soiled water supplied to them?

A. A very few of them.

Q. 113. Would you expect any difficulty in operating properly designed hydro-electric plants with water of the character of this exhibit?

A. None whatever.

Mr. Blakeslee: That is all.

CROSS EXAMINATION.

By Mr. Westall:

XQ. 114. You have made the remark in answering one question, that you did not think that the water ^{wheel} in use at the Power Development Company's plant at the Kern River Canyon could not handle a change of load, even with an efficient modern form of governor. Will you please explain a little more fully what you had in mind?

A. The wheels are not of sufficient capacity.

XQ. 115. And what do you mean by "not of sufficient capacity?"

A. The change of load on a system of the size of the San Joaquin Light and Power Company's system might be very much greater than the capacity of the combined machines of the Power Development Company station. For instance, supposing the San Joaquin system were using 25,000 horse-power and there should be a sudden change of load of 8,000 horse-power. That is, the load would pick up 8,000 horse-power. The wheels at the Power Development Company's plant could not pick up any such load as that. Their total capacity is only about five or six hundred horse-power. So that they, as a factor in the governing of that system, would cut very

little figure. In fact they could not be used to govern the system.

XQ. 116 You have stated that in your opinion the apparatus attempted to be illustrated in "Complainant's Exhibit Wilson Sketch B" would not be as efficient, if I may use the word, for the purpose for which it is evidently designed, or for governing, as that illustrated in "Complainant's Exhibit Wilson Sketch A." Will you please explain why you would not consider the device shown in Sketch B as efficient as that shown in Sketch A?

A. Let me ask a question. I understand that I am on the witness stand as a witness and not to give expert testimony. In my explanation of that before, I gave the explanation that the opening of this by-pass is not a synchronous opening with the opening of these gates. For this reason the by-pass will not by-pass in exact inverse proportion to the opening of those gates. I thought I made that clear when I explained it before. That, of course, is on the basis of this sketch. I do not mean to say that this could not be so constructed or designed that the desired effect might be reached. But not according to this sketch.

XO. 117. Then would you say that the butterfly valve for the control of the by-pass, arranged in a manner resembling that, would be as efficient as the device attempted to be shown in Sketch A?

A. I did not say that it would be as efficient as Sketch A, under any consideration.

XQ. 118. Will you please state why?

A. That brings me into a technical explanation.

Mr. Blakeslee: The present witness, so far as he has been examined, was examined as to questions of fact

pertinent to the various installations ^{of} and various devices and suggested devices, and has not been examined as an expert witness for the purpose of expertation. He has stated how these various valves operated or would operate, and it is not believed that the question is proper which goes into pure expertation. If counsel persists in this inquiry, he is making the witness his own and we object to this line of questioning as not warranted by the direct examination, and as not cross-examination.

Mr. Westall: Do I understand from counsel's remarks that he wishes to be understood as taking the position that this witness is not qualified and has not been qualified to testify as an expert concerning these various sketches about which he has been interrogated?

Mr. Blakeslee: On the contrary, we contend that he is most expert and qualified, and, aside from that, counsel can take my remarks as he wishes.

Mr. Westall: Then if the witness has been properly qualified and no question has heretofore been raised as to that point, I will ask that the question be repeated and that it be answered by the witness, if he is able to do so.

Mr. Blakeslee: Very well. If counsel insists on making an expert out of this witness for the purpose of expertation by giving testimony, he makes the witness his own and he can arrange with the witness for compensation of the witness as such expert.

Mr. Westall: Counsel for defendant suggests that the witness has been called to testify as an expert for plaintiff and is now being subjected to cross-examination.

Mr. Blakeslee: That is a miss-statement. I did not so state. I said his examination has to me proven that he is an expert in his line, but he may be an expert in

this line and at the same time he may play tennis, and in so doing he is not acting as an expert, although able to.

Mr. Westall: Counsel for defendant suggests that if the witness is reluctant or will not answer proper questions as to these sketches which have been fully inquired about on direct examination, that he will ask the court that all of the direct testimony concerning the sketches be stricken out and withheld from consideration by the court.

Mr. Blakeslee: Do as you please.

Mr. Westall: The Examiner is asked to repeat the question.

Mr. Blakeslee: We notify the witness that if in his good judgment he believes that he is being examined by counsel for defendant as an expert, he may refuse to serve as such expert without making arrangements with counsel for defendant to act as his expert. So he may protect himself as he deems best under the circumstances.

A. Well, I think that the question as asked is leading into the question of design for efficiency, and it might take considerable time to practically give a technical explanation of why the butterfly by-pass must be treated somewhat differently from the needle by-pass in order to get the desired effect, the two being in one class, as against the Sketches C, D and E, which are in an entirely different class, the first two being balanced valves, and C, D and E not being balanced valves.

Mr. Blakeslee: And all my questions were directed to questions of fact relating to the friction and water pressure, and so forth.

A. The questions I have answered so far are questions of fact and not questions of opinion or calculation. If I am supposed to act as an expert witness as to the various types of design, I do not think under the present conditions I should be asked that.

Mr. Blakeslee: And you need not do so, since you are the witness for complainant, unless you make arrangements to that end with counsel for the defendant.

A. I would be very glad to answer questions of fact, so far as they are within my knowledge and ability to do so.

XQ. 119. By Mr. Westall: And do I understand that you have not the knowledge to answer the question as put?

Mr. Blakeslee: We object to that question as frivolous.

Mr. Westall: Change that.

XQ. 120. Do I understand that you take the position that you have not the necessary knowledge or inclination to answer the question that has been put?

A. I certainly have it, if it is necessary to give it.

Mr. Westall: The witness having under the direction of counsel refused to answer or to respond to proper cross-examination as to the sketches which were fully inquired about upon direct examination, it is moved that all the testimony of the witness regarding these sketches and making these comparisons be stricken out and withheld from consideration of the court, and notice is given to counsel that at the time of the argument this motion will be presented and insisted upon.

Mr. Blakeslee: It will be taken up at the same time as the motion presented to strike out certain portions,

if not all, of the deposition of the witness Berry, on the ground that he was coached by counsel for defendant and others, while on the stand.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

RDQ. 121. Is there or is there not any reason why the Power Development Company plant which you previously referred to could not or cannot be governed alone or by itself, if, for instance, it were severed from the other plant or plants upon the synchronous circuit in which it is now included?

Mr. Westll: Objected to as not proper redirect examination.

A. There is no reason why it could not be governed providing it has proper governors.

Mr. Blakeslee: That is all.

Office of George J. Henry, Jr.,
737 Rialto Building.

San Francisco, Cal., Monday, February 22, 1915.

10 o'clock a. m.

By consent of counsel an adjournment is now taken until tomorrow, February 23, 1915, 10 o'clock a. m.

Office of George J. Henry, Jr.,
737 Rialto Building.

San Francisco, Cal., February 23, 1915.

10 o'clock a. m.

This being the time and place to which the further taking of testimony in rebuttal on behalf of complainant was continued, proceedings are now resumed.

Present:

Raymond Ives Blakeslee, Esq., solicitor for complainant.

Joseph F. Westall, Esq., solicitor for defendant.

Mr. Blakeslee: Counsel for complainant states that it is impossible to obtain the attendance of the witness desired to be examined on behalf of complainant, and therefore asks that an adjournment be taken until 2 o'clock p. m.

Mr. Westall: Counsel for the defendant wishes the record to show that he protests against the delay in the taking of these depositions, and objects to the failure on the part of complainant to take steps to procure the attendance of witnesses. Counsel states that on Friday last he consented to an adjournment over Saturday on the promise that witness would be present on Monday morning at 10 o'clock. Instead of there being any wit-

nesses present there was no one present at the time to which we adjourned but the Examiner and counsel for the defendant, and there was no notification that further adjournment would be requested. Counsel for complainant is reminded that attendance at San Francisco involves a great deal of expense, and that this long delay could have been avoided by taking steps on Friday last to compel the attendance of witnesses by subpoena. During the taking of defendant's testimony during the cross-examination of the witness Cobb it became necessary to adjourn the proceedings to a day other than had been ^{there}fore agreed upon. On page 726 of the record, under ^{the} date of April 14, 1913, appears the record of many strenuous objections that were interposed by counsel for complainant when that adjournment was requested, although in that case counsel for complainant had been previously advised that the adjournment would be asked, and the Examiner had been so advised. In order to save space in the record, all objections which were interposed by counsel for complainant to the adjournment of April 14, 1914, (record page 726) will be understood as being adopted, so far as proper and pertinent to the present situation here, without being specifically recopied into the record.

Mr. Blakeslee: In response to counsel's objections just made on the record, it is to be noted that we have been laboring under a difficulty with respect to the production of witnesses during this session of taking testimony in this city, consisting in the occurrence of three legal holidays in this city incident to the opening of the San Francisco Exposition. We crowded the testimony of four witnesses into Friday of last week, and

made strenuous efforts to obtain other witnesses to follow, but the legal holidays themselves, coupled with a severe throat trouble of counsel for complainant which made it impossible, almost, for him to talk intelligibly, made it necessary for us to take an adjournment until this morning. This morning we were unable to obtain a witness, and attempted to obtain other witnesses for this afternoon, and the endeavors to do which have resulted in obtaining a witness who will be here presently. The court will appreciate the difficulty counsel labors under in obtaining the witnesses in traveling from place to place and taking proofs of this sort, all of which is fully covered by the stipulation in this case and usual practice in such matters. As for subpoenaing witnesses, it is pointed out that it is rather difficult to obtain subpoenas when the courts are not in session and the clerk's office is closed due to the legal holiday observations, and there have been three such holidays prior to today. Counsel is here and has consented to the adjournment and the record speaks for itself.

(Whereupon an adjournment was taken until 2 o'clock p. m., at this same place.)

February 23, 1915, P. M.

ARTHUR H. HALLORAN, called as a witness on behalf of complainant, being first duly sworn according to law to testify the truth, the whole truth and nothing but the truth, testified in rebuttal as follows:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and occupation.

A. Age, thirty-two; residence, Berkeley, California; occupation, manager and editor of The Journal of Electricity, Power & Gas.

Q. 2. Where is that publication edited and printed?

A. It is edited and printed in San Francisco.

Q. 3. How long have you been connected with that publication in the capacity which you have stated?

A. Seven and three-quarters years.

Q. 4. Without interruption?

A. Without interruption.

Q. 5. What opportunity have you to receive direct knowledge of the publication and issuance of the consecutive volumes and numbers of volumes of that publication?

A. I have complete charge of the editorial matter that goes into that paper, and have had during that period.

Q. 6. In what manner are you apprised of the issue of each number? That is, the publication of the same.

A. I do not understand your question.

Q. 7. In what manner, if any, are you notified as to the printing and issuing or publishing of the numbers of this publication?

A. By the fact that I have charge of the manuscript its editing, proof reading, making the dummy for the paper, ordering paper for the printing to be done, and

receiving the first copy of the paper that comes from the press.

Q. 8. And are you also advised as to the distribution of the published volumes?

A. Yes sir.

Q. 9. How often are these numbers issued?

A. These numbers are issued weekly.

Q. 10. I now show you what purports to be a copy of a publication entitled "Journal of Electricity, Power and Gas," Volume No. XXVIII, (twenty-eight) in Roman characters, and No. 19, Arabec characters, and ask you if you know anything about this book?

A. This is the regular issue of that publication on that date. This particular number was taken from our office files and is a complete and unchanged copy in every respect.

Q. 11. What date was it published upon?

A. May 11, 1912.

Q. 12. Is this the same Journal of Electricity which you have testified as to your connection with?

A. It is the same paper.

Q. 13. And this is an exact copy of this number which was published, issued and distributed at and from the city of San Francisco, California?

A. Yes, sir.

Q. 14. Approximately what is your circulation?

A. Twenty-five hundred.

Q. 15. What is the field of its circulation principally?

A. Among the engineers and electric power and light companies in the territory west of the Rocky Mountains.

Mr. Blakeslee: We offer in evidence this number of

the said publication as "Complainant's Exhibit Copy of Issue of May 11, 1912, Journal of Electricity, Power and Gas."

Mr. Westall: May I ask counsel the purpose and object of producing and offering the evidence, and what it is designed to prove?

Mr. Blakeslee: In connection with the offer and with the inquiry of counsel we will state that the offer pertains, as to the contents of this issue, to the first or leading article entitled "San Joaquin Light & Power Corporation," and that the remaining contents of the book are not within the offer other than to make a complete offer of the publication and in order that it may be a genuine and full specimen of the issue of the number of which this is a copy. And, further, in order to show the court that it is common knowledge by means of this publication that the plant referred to in these proceedings as the Power Development Company plant and the plant referred to in these proceedings as the Crane Valley plant are connected up together in a synchronous system of electrical distribution under the control of a governor of the Lombard type including features such as that embodied in "Complainant's Exhibit W," as testified by the witness Van Norden, who appeared on behalf of the complainant in rebuttal.

Mr. Westall: Counsel for defendant objects to the evidence and to the purported copy of the Journal of Electricity, Power and Gas, just offered in evidence, as incompetent, irrelevant, immaterial, and not proper rebuttal, and as an improper method of proving any of the statements contained in the article referred to by counsel, as consisting merely of hearsay and as not affording

counsel for defendant any opportunity to cross-examine the writer of the article, and as not being the best evidence, there being no foundation laid for any copy of the original purported copy of the article referred to.

Mr. Blakeslee: In response to counsel's statement, we will say that we are about to call the writer of this article who may be cross-examined as to the preparation of the article in question.

Mr. Westall: The calling of the writer of the article would not obviate the objection. It is here attempted to get the article written by the witness in as a direct deposition apparently by him, and to now offer to produce the alleged writer for cross-examination would not and cannot obviate the objections which have been made.

Mr. Blakeslee: It is further to be noted that this witness has been on the stand before and counsel has had an opportunity to cross-examine him as to the matters of this article.

Mr. Westall: Counsel for the defendant is not informed as to what the contents of the article may be and confined his cross-examination only to the matters brought out on direct examination so far as appeared pertinent.

Mr. Blakeslee: Of course, the publication is a publication, and that is as far as this exhibit itself goes, and what we are proving by this witness as to the publication of this article, and not the literary subject matter.

Mr. Westall: If the only object was to prove that such an article was published, then the objection is reiterated that it is entirely incompetent, irrelevant, immaterial and not in rebuttal.

Mr. Blakeslee: We will make the contents of it relevant, material and competent in so far as it is not now, if that be the case. We have called attention of counsel for defendant to the fact that the subject matter of this article has been testified about by one witness, and the facts have been testified to by two during these rebuttal proceedings, and the purpose of offering the publication is manifest.

(The said publication so offered in evidence is marked "Complainant's Exhibit Copy of Issue of May 11, 1912, of Journal of Electricity, Power and Gas," together with the title of the court and cause and the date upon which the said exhibit was offered in evidence.)

Q. 16. By Mr. Blakeslee: Referring to this first article in this Journal of Electricity, Power & Gas, the number of May 11, 1912, do you know who prepared the copy or manuscript of this article entitled "San Joaquin Light & Power Corporation?"

A. Rudolph W. Van Norden.

Q. 17. Do you know who he is?

A. A consulting engineer of San Francisco.

Q. 18. Is he present in the room at this time?

A. Yes, sir.

CROSS-EXAMINATION

By Mr. Westall:

XQ. 19. How long has the publication to which you have referred been called the Journal of Electricity, Power and Gas?

A. Since September, 1895.

XQ. 20. What was it called before that time?

A. It was originally established in 1887 under the name of "Pacific Lumberman, Contractor and Electrician."

XQ. 21. How long did it go under that name, if you know?

A. I don't know how long it was published under that name.

XQ. 22. What was the next name that it was known under?

A. The Journal of Electricity.

XQ. 23. For how long a time and when was it known under that name?

A. My statements in the past have been erroneous. It was entered as second class matter at the San Francisco post office as the Electrical Journal in July, 1895. It was changed to the "Journal of Electricity, Power & Gas," August 15, 1899. Entry changed May 1, 1906, to "Journal of Electricity, Power and Gas, Weekly."

XQ. 24. What has been the character of this publication as to the contents and as to the reliability and circulation since it was first known as the Electrical Journal, if you know?

Mr. Blakeslee: Objected to as not cross-examination, in so far as it takes into consideration a period prior to the year 1912.

A. Its contents have been principally technical records of the hydro-electric development of the western states. Its articles have been written by leading engineers of this territory, and the paper has a high standing as a technical magazine.

XQ. 25. What have you to say as to the circulation during the time I have mentioned?

Mr. Blakeslee: Objected to on the same grounds and the apparent attempt of counsel to bolster up the defense's case with respect to the publication of this name or some similar name.

A. During the period of time I am personally familiar with the circulation, it varied from 2,000 to 3,000 copies weekly.

Mr. Westall: I believe that is all.

REDIRECT EXAMINATION

By Mr. Blakeslee:

RDQ. 26. How early a date can you give as that covering your own personal knowledge as to the nature of this publication, its field and its contributing writers?

A. My personal connection with the paper has extended since April 20, 1907, seven years prior to that time I saw the publication regularly as issued, but had no connection therewith.

Mr. Blakeslee: That is all.

RECROSS EXAMINATION

By Mr. Westall:

RXQ. 27. Then you saw it when it was known as the Journal of Electricity did you?

A. I have in my possession bound volumes of the paper.

RUDOLPH W. VAN NORDEN, a witness heretofore produced and sworn on behalf of complainant in rebuttal, being recalled on behalf of complainant in rebuttal, further testified for complainant in rebuttal as follows:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 122. You have testified previously in this case with respect to a certain synchronous system of power distribution known as that of the San Joaquin Light & Power Corporation, in the State of California, such system including the plants known as the Crane Valley station and the Power Development Company or Power, Transit & Light Company station, located near Bakersfield, California, at the point where the Kern River leaves the canyon. Have you at any time ever prepared any article for publication dealing with that subject?

A. I have.

Q. 123. When did you prepare such article?

Mr. Westall: Objected to as incompetent, irrelevant, immaterial and not proper rebuttal.

A. April, 1912.

Q. 124. By Mr. Blakeslee: Do you know what was done with this article when you prepared it?

Mr. Westall: The same objection.

A. It was published in the Journal of Electricity, Power and Gas, on May 11, 1912.

Q. 125. By Mr. Blakeslee: Where was that publication made?

A. In San Francisco, California.

Q. 126. I call your attention to "Complainant's Exhibit Copy of Issue of May 11, 1912, of Journal of Electricity, Power and Gas," and ask you if this is a specimen of the publication of date of May 11, 1912, to which you have just referred?

Mr. Westall: The same objection.

A. It is.

Q. 127. By Mr. Blakeslee: Is the article in this publication entitled "San Joaquin Light and Power Corporation" which purports to have been written by Rudolph W. Van Norden the article you refer to?

Mr. Westall: I object to the method of proving the article or the contents thereof, and also the objections as heretofore interposed to the subject matter are repeated.

A. It is.

Q. 128. By Mr. Blakeslee: Does this article in any portions of it relate to the governing of the said Power Development Company's plant and the governing of the Crane Valley plant simultaneously or synchronously by means of a governor you referred to in your previous testimony as being installed at the Crane Valley plant?

Mr. Westall: Objected to for the reason that the purported article speaks for itself as to what it refers to, and as an improper method of proving the contents of the article or any of the statements made in the article or the subject matter thereof.

A. The article describes the type of the governors and method of governing, and also the fact that the various plants operate in synchronism.

Q. 129. By Mr. Blakeslee: Please refer to this article and quote briefly excerpts therefrom bearing upon these points.

Mr. Westall: The same objections are repeated.

A. On page 439, beginning with the top of the second column, it reads as follows:

"There are four main generating units. The generators are General Electric 4,000 k.v.a., 2,300 volt, 3-phase,

and operate at 400 r.p.m. The water wheel is a single overhung Doble runner enclosed in a cast-iron housing and is equipped with two needle nozzles. The upper or main nozzle is operated by a type Q Lombard governor. The lower nozzle is a by-pass and opens when the main nozzle closes, thus removing the water from the wheel without shock to the pipe lines. The automatic mechanism gradually closes the by-pass needle so that water may be conserved when it is not in use on the wheel."

Q. 130. By Mr. Blakeslee: To which plant does this excerpt refer?

Mr. Westall: The same objection.

A. The San Joaquin No. 1, commonly known as the Crane Valley plant. On page 442, about the middle of the first column, in speaking of the Power Development plant at the mouth of the Kern River canyon and its connection into the transmission system and with the San Joaquin plant, is the following:

"A two-circuit transmission line conveys the current to Bakersfield, where it is synchronized with the other 10,000 volt circuits in this district."

Q. 131. By Mr. Blakeslee: Is there any illustration in this article which shows diagrammatically or otherwise the inter-relation of these stations in this synchronous system and the connection of one with the other, subject to the governing by the Crane Valley plant?

Mr. Westall: Objected to for the reason that the purported article speaks for itself as to what it contains, and also on the ground that the question calls for not the best evidence as to the location and inter-relation of the different plants, and the previous objections as to

to this pamphlet and this article and as to the contents thereof are repeated.

A. On page 429 is a map of the San Joaquin Light & Power Corporation's system in which the various transmission lines are plainly shown, and the connections between the Crane Valley plant and the Kern River plant. On page 439 is a general view of San Joaquin No. 1, or Crane Valley power house, and on the following pages are interior views of which one shows distinctly the type Q Lombard governors. On page 441 is a view of the Kern River plant.

Mr. Westall: Defendant moves that all that part of the answer beginning with "On page 439" be stricken out as not responsive to the question, and as incompetent, irrelevant and immaterial.

Q. 132. By Mr. Blakeslee: Are these two pictures of the plant you refer to the same plants that you have testified about last in this case, referred to generally as the Crane Valley plant and the Power Development Company plant, or Power, Transit & Light Company plant?

A. They are.

Q. 133. I note on page 441 of this article in the second column the following matter:

"Between the hydraulic gates and the water wheel are butterfly valves which are operated by a cast-iron hand wheel and column."

This matter appearing under the heading "Kern Canyon Power Plant." Are these the same butterfly valves, hand operated, which you referred to in your testimony last Friday in this case in describing that plant?

Mr. Westall: Objected to as leading, and also for the reasons hereinbefore stated, as not the proper method of proving the contents of the purported article in question, and as not the best evidence.

A. I think these are not, as these butterfly valves are in the main feeder line, but I am not sure on that point.

Q. 134. By Mr. Blakeslee: If I am mistaken in your testimony in these respects, I have confused it with the testimony of some other witness. Please state whether or not this refers to the method of control of the supply of water to the wheels at that plant, that is, this quoted matter?

A. You mean in the article?

Q. 135. Yes.

Mr. Westall: Objected to as assuming that the witness is able to read the mind of counsel and find out in what respect he is mistaken and that it is otherwise incompetent, irrelevant and immaterial and also leading.

Mr. Blakeslee: The witness does not have to read my mind. All he has to do is to read the quoted matter and tell us whether or not that refers to what I have asked.

A. The butterfly valves are in the main feed line between the hydraulically operated valve and the water wheel.

Mr. Blakeslee: That is all.

Mr. Westall: Cross-examination waived.

GEORGE J. HENRY, JR., complainant herein, previously sworn, being recalled on behalf of complainant in rebuttal, testified as follows:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 478. Do you know of a certain hydro-electric plant or station known as the Power Development Company plant or Power, Transit & Light Company plant, situated about 16 miles from the city of Bakersfield in the County of Kern, California, at the mouth of the Kern River Canyon?

A. I do.

Q. 479. Have you ever visited that plant?

A. Yes, sir; I visited the plant several times.

Q. 480. When did you last visit it?

A. On Thursday of last week, February 18.

Q. 481. In whose company did you visit it at that time, if anybody?

A. In the company of Mr. J. F. Dearth who had formerly operated the plant a number of years, Mr. Benjamin the Examiner, Mr. Blakeslee my attorney, and Mr. Westall, attorney for defendant.

Q. 482. Did you make an inspection of that plant on the occasion of that visit?

A. I did.

Q. 483. How long were you there?

A. We were there approximately six hours, during which we examined it as thoroughly as possible to examine a plant outwardly without taking to pieces the various parts or getting into the wheel housings.

Q. 484. Was any deposition taken on behalf of yourself, complainant in this case, at the time of that visit at that plant?

A. Yes, sir; the deposition of J. F. Dearth was taken

at that time and I was present during the taking of most of it.

Q. 485. You heard the deposition, did you?

A. I did.

Q. 486. Have you also read the depositions of Edward S. Cobb, S. L. Berry, B. C. Van Emon and J. A. Lighthipe, witnesses produced on behalf of defendant in this case?

A. I have, and I have also heard the deposition of the witness Sessions and Carroll N. Beal given on Friday of last week in my presence in connection with this same plant.

Q. 487. Please state how many generator units you found installed at that plant last week.

A. Three main generator units, each operated by a water-wheel unit.

Q. 488. Please give a general summary of the system and method of control of the water-wheel units of said three generators in vogue or in use at that Power Development Company plant when you were there last week.

Mr. Westall: Objected to as incompetent, irrelevant, immaterial and not proper rebuttal.

A. The only automatic method of control of the units in this station is in the combination with an electric transmission system. The generators of this station run in synchronism with and feed into the main supply lines of the San Joaquin Light & Power Company supplied by other plants. In one or more of the other plants automatic governors are provided to take care of the load fluctuations on the system. No automatic governing devices are provided within the station which we visited,

the system depending for its automatic control upon modern governors and water-wheel nozzles located in other stations supplying this same system and running in synchronism with the Power Development Company plant which we visited.

Q. 489. By Mr. Blakeslee: In so far as the governing of this plant is concerned is it or is it not material whether the actual governing apparatus is installed directly in or at this Power Development Company station or at a remote point, as at one of the other power houses which you have mentioned, which are connected up together in this synchronous system of distribution which you have referred to?

A. The common practice is to do the automatic controlling on one or more of the units, of which there may be many, feeding into such a synchronous system. It is a well recognized method adopted in all power transmission systems today. In the early days of electric power transmission there was usually but one plant feeding into a single transmission line, in which case it was necessary to automatically control at least one or more of the units in the power station, if accurate speed control was to be maintained, as was always desirable.

Q. 490. Then can it be truthfully said that this Power Development Company plant is governed or controlled at the present time by a modern governor or is it not?

A. Yes, sir; it can be truthfully said that it is so controlled by automatic governors located in other plants feeding into the same lines. Automatic control from the observation of the lights in Bakersfield to which this system supplies power would indicate a very satisfac-

tory speed control of the water-wheel units. This speed was maintained during such time as I visited the plant in question very accurately, as indicated by the tachometers which were driven from each of the water-wheel units. Had any variation of speed occurred in these generators due to insufficient or inefficient governing by the plant which was governing on the system, it would have shown itself by a variation of the speed in the units in this plant. These variations in ordinary practice occur many times a minute in ordinary times, and, therefore, a 6-hour observation of the plant and the observation of the lights in Bakersfield during a period of two hours would indicate with a good degree of positiveness the accuracy of governing being maintained on the system.

Q. 491. Do I understand in your last answer that the lights in the city of Bakersfield to which you refer are energized by electricity generated at this Power Development Company plant?

A. They are energized from electricity supplied from a circuit, which circuit is supplied by the Power Development Company's plant and others, the automatic regulation being provided on the other plants feeding into the system.

Q. 492. So that I understand there is a certain what we may term fund of electrical energy which is drawn upon for the energization of the lights in the city of Bakersfield, and the Power Development Company contributes to the upkeep of this fund, and the Power Development Company with the other plant contributing to such upkeep of this fund are all governed at one or more

stations than the Power Development Company. Is that correct?

A. That is a correct statement.

Q. 493. Please briefly state what if any means were employed last week at this Power Development Company plant for determining the supply of water to the several wheel units.

A. The method installed apparently and that which had apparently been installed for a very long time, judging from the condition of the parts, and the design of the various elements was that of introducing a butterfly or balanced-type of valve—the frictionless type—located in the supply pipe between the main hydraulic gate and the water-wheel nozzles, such that by shifting the butterfly valve in the said pipe, the butterfly valve would permit a greater or less flow of water to the nozzles of the corresponding wheels.

Q. 494. How was such actuation of such butterfly valves produced?

A. The butterfly valves were each mounted upon a spindle or shaft extending across the diameter of the feed pipe, and on this shaft was mounted a worm gear into which meshed a worm wheel which was mounted upon a suitable shaft, carrying also a hand wheel at one end, and through suitable gearing could be operated from the wheel before mentioned or from a secondary hand wheel located at a remote part of the floor and adjacent to the switchboard, so that the station operator close to the main switchboard might by rotating this second hand wheel from each or any of the valves shown, operate its corresponding valve and reduce or increase the quantity

of power being supplied to the water wheel by varying the current of water flowing thereto, and thereby varying the power supplied by the water wheel to the generator, and the generator to the electric distribution system.

Q. 495. In connection with the pipe-line for supplying water to the wheels of this plant did you find any relief means or devices last week?

A. Yes; there is a relief means located outside of the power house consisting of an entirely independent valve operated entirely independent of any by-pass valve, with connections so that it may also be operated from an independent point near the switchboard, so that in the event of its becoming necessary to quickly close off the water flowing to any or all of the water wheels in this station, the relief valves might by a separate movement of the hand controlling device be opened to admit or discharge the water so as to prevent a water ram in the pipe-line.

Q. 496. And is that relief valve operated in mechanical unison with any other valve in that plant?

A. Not by any inter-connection with other valves. It requires separate and distinct operation on the part of the operator.

Q. 497. And how does he affect such operation? That is, by what sort of control?

A. The relief valve mentioned is located outside of the power house and is actuated by a lever located near the switchboard inside of the power house.

Q. 498. And that lever is worked how?

A. That lever is operated by hand. Subsequent to the opening of said relief it would be proper to close the

other end or all of the butterfly valves controlling the flow of water to the water wheels. In this way suitable relief is provided to prevent a dangerous water ram in the pipe-line upon the closure of the main control butterfly valve.

Q. 499. Is there any governing now in that plant which either separately or jointly controls the operation of these three butterfly valves and this outside relief valve?

Mr. Westall: All these questions and this line of questioning is objected to as incompetent, irrelevant and immaterial. The precise construction and arrangement of the valves in the plant referred to can have no pertinence to any issue raised in this case at this late period, so many years after the time at which the anticipation set up in the answer was proven to have been in use.

Mr. Blakeslee: We call the attention of the Examiner to the new equity rules and the provisions thereof in respect to argumentative matter introduced by counsel in the course of taking proof, and ask that he bear in mind such rules in transcribing the record.

A. There is no automatic governing of any kind on any of the water wheels in this station, nor any device which could perform any automatic functions governing the water power equipment.

Q. 500. By Mr. Blakeslee: That is, I take it you mean to state directly at this station?

A. Yes. This testimony refers specifically to the apparatus in this station.

Q. 501. Did you or did you not find upon the pipeline of this plant last week any other device which has

or might have any effect upon pressure conditions in the pipe-line?

Mr. Westall: Objected to for the reasons heretofore stated.

A. Yes; there is an air-chamber mounted upon the distributing drum or head at the end of the pipe-line immediately outside of the power house, and from which the water wheels are supplied with water. This air-chamber is a well-known device in the early art for absorbing inertia effects produced in a moving water column upon the movement of valves to vary the velocity of the water flow.

Q. 502. By Mr. Blakeslee: Did you find any other device or apparatus installed at or in connection with the pipe-line at the plant last week for regulatng the speed or supply of water to the plant?

A. Yes; there were several other devices which are used by operators in controlling the water at this station. There are hydraulic valves located in each pipe branch in addition to the butterfly valves above mentioned, each of which is controlled by its own independent hydraulic connections and hand lever from a point near the switchboard, so that any of these may open or close from the switchboard location. There is also provided at the pipe inlet a float and indicator device which is observed through a telescope mounted inside of the power house by which telescope the operators observe the exact stage of the water at the pipe intake in order to more intelligently shift the valves by hand to utilize to the most efficient degree the water supplying the plant.

Q. 503. During this visit to this plant last week did

you find any by-pass or relief devices upon the feed pipes at or adjacent to the wheel cases?

Mr. Westall: The same objection will be understood as repeated after each and every of the questions concerning the precise and exact construction of the plant.

A. There were no relief valves or devices in operation or connected in any operative manner with any of the wheels in this plant, although there were by-pass outlets which were sealed or closed in a fixed manner with plates indicating that there might possibly at an earlier date have been intended to be installed here some form of by-pass valve.

Mr. Westall: I move to strike the answer out as being almost entirely based upon guess and conjecture and not upon facts. The witness can state what he observed, and his conclusions and guesses and surmises as to what he testifies to are for the court and not for the witness.

A. I desire to correct my last answer if it implied in any way the possibility of any operative device having been connected on the feeder pipes to these water wheels for the purpose of water relief, as I do not consider that there was any evidence in these pipes of any operative device being possibly connected thereto. There appeared to be outlets in each of the pipes which were sealed over and closed. There was no operative connection or operating connections of any kind in connection therewith.

Q. 504. By Mr. Blakeslee: Then as I understand it, in order to clothe these various sealed outlets with the functions of a by-pass, it would require somewhat of a guess or conjecture, such as counsel for defendant sug-

gests? That is, in order to frame the hypothesis that there was or had been any by-pass device at these points?

Mr. Westall: Objected to. Let the witness state what he saw and what he observed and not enter the realm of guessing. What we want now is facts.

Mr. Blakeslee: We were adopting the guess route because counsel had suggested it, and, apparently, it fits the case.

A. There was no by-pass on either of these three wheels when I visited the plant. It would require a stretch of imagination and the addition of physical parts and a subtraction of other physical parts in order to secure a by-pass to any of these wheels.

Q. 505. I show you a bottle which apparently has liquid contents and is marked "Complainant's Exhibit Bottle of Kern River Water at Power Development Plant," and ask you if you have ever seen this bottle and its contents before?

A. Yes.

Q. 506. When and where and under what circumstances?

A. I saw Mr. J. F. Dearth fill this bottle with water from the reservoir or header supplying the wheels at the plant above referred to, on February 18, and know it to be a sample of water supplying these wheels and their hand-controlling apparatus and gate valves and pipelines and air-chambers.

Q. 507. From what source of supply did this water come?

A. It came from the water supplying the water

wheels and is an average sample of such water at the time I visited the plant. It primarily goes to the plant through a suitable tunnel and then down the pipe-line, being taken originally from the Kern River at a point a short distance above the plant on the river.

Q. 508. Have you made an optical examination of the water of this exhibit as to clarity, matter in suspension, visible contents, and the like?

A. I have.

Q. 509. In these respects please state from your experience how this water compares with the water supplying other hydro-electric power plants in the state of California with which you are familiar.

A. The water is particularly clear and well adapted to the operation of such plants and the controlling devices in connection therewith. It is entirely free from sand and cutting material of any kind and contains nothing but an extremely small quantity of decomposed vegetable matter in suspension which has absolutely no physical effect upon the operating parts of such plant.

Q. 510. Does the content of the stream water supplied to power stations in California vary from period to period of the year in amount, and in what manner.

A. It does. There being usually a heavier fall during the rainy period, some streams are more torrential in their nature than others, and evidence of torrential streams is usually found in the river beds, especially at those where the stream falls rapidly and at which points power plants are usually located. No unusual condition were observed by me, although I looked for these on the Kern River in or about the plant above testified to. The

sample of water which I have just examined and which I saw Mr. Dearth take from the water supplying the water wheels above testified to, was taken on the 18th day of February, during the winter season, and after a period of rainy weather in the mountains and adjacent territory, and should therefore be, if anything, a worse sample than would be obtained during the summer time and early winter period.

Q. 511. To your knowledge is there any variation discovered as being between the streams of the different parts of the state of California with respect to the content of silt and other comminuted matter, organic or inorganic?

Mr. Westall: Objected to as incompetent, immaterial and not proper rebuttal.

A. Yes; there is more organic material in the streams in the northern part of the state, on account of their being fed from territory having greater amounts of vegetation. There is more cutting materials in streams flowing from the Sierra Nevada Mountains in the central part of the state, as a rule, than with the streams of either the northern or southern part of the state. This applies particularly to streams coming from a watershed containing mining operations. I would therefore make the general statement that the streams of the central and northern part of the state are inferior to the streams below the Mother Lode district as regards the quantities of organic and inorganic suspended matter.

Q. 512. By Mr. Blakeslee: Within which general division of the streams as last made by you would that of the Kern River supplying this Power Development Company plant fall?

A. It would fall in the territory more favorable to this water being free from suspended organic and inorganic material, sand, silt, and so forth.

Q. 513. During your stay at this plant last week were any photographs taken by any person present to your knowledge?

A. Yes; I took a series of photographs at the plant on February 18, during the visit above testified to.

Q. 514. Can you produce prints of these photographs?

A. I can. (Witness produces nine mounted photographic prints which, upon the mounts of the same, are marked, respectively, "A" to "I", inclusive.)

Q. 515. I notice in certain of these photographs there appears the picture of a certain individual. Can you tell me who is so shown?

A. That is Mr. J. F. Dearth, the party who I previously testified accompanied me on the inspection of the plant.

Q. 516. Generally speaking, what do these photographs disclose?

A. They show parts of the apparatus in and about the Power Development Company station about which I have been testifying today.

Q. 517. And those photographs which apparently show objects and things outdoors were also taken of the respective objects at or near that plant?

A. All these pictures were taken on that day in and about the plant and refer specifically to the apparatus about which I have been testifying, with the exception of the one marked "A", which shows parts dug out of an

old scrap pile at the power plant and arranged with Mr. Dearth in the foreground to show certain parts which might have been inoperative and had been abandoned.

Q. 518 In Mr. Dearth's deposition reference is made to a number of objects or fragments of apparatus which he testified were arranged upon the pipe-line or penstock of this plant on that day, and which in his testimony he described, referring to these various objects or parts or fragments, by means of Roman numerals, figures one to ten, he also testifying that a photograph was taken of him and of these parts together on the same day, by yourself. Is that photograph among those?

A. That photograph is, and is marked "A".

Q. 519. You have referred in your previous testimony today to the hand-operated butterfly valve devices upon the feeder pipes supplying the wheels on this Power Development Company plant as you found it last week. Are these feeders shown in any of these photographs, and, if so, in which, and, if so how are the same designated in the photographs?

A. They are shown in photographs "B", "I", "D" and "E". In each of these pictures the worm gear mounted on the stem of the butterfly valve projecting from the supply-pipe is shown and has chalked thereon in photographs "B", "D" and "E", the figures 11, the operating stem carrying also the worm which meshes into this worm gear, as shown horizontally above the wheel and has mounted to the left thereof, the primary hand wheel. This horizontal stem extends also and is particularly well shown in photos "B" and "E" with gear connections through a vertical cast-iron pedestal

and a rotating shaft along the floor shown well in photo "B", by which rotating shaft this butterfly valve may be rotated through its worm gear and worm 11 from a more distant point nearer the switchboard..

Q. 520. You have also referred in your previous testimony given today about the Power Development Company plant, to a certain sealed or capped apparent outlet, or intended outlet, upon the feeder pipe or pipes of certain of the wheels of this plant as found by you last week. Will you please point these out in the photographs, if they there appear, using such indicating wording as you wish with a leading line to the part.

A. The photograph "D" clearly shows this sealed-up opening at the place where I have marked "Sealed Outlet." I have also marked "Sealed Outlet" at the corresponding point on the photograph "B", and on the photograph "E". These are sealed over by a cast-iron flange bolted thereto so as to completely and entirely cover the opening. No valve of any kind is used in connection with these sealed outlets. In exhibit "I" the connecting castings are shown without any form of operable valve or opening device therein, and I have marked this "Supporting Pipe" on the said photograph.

Q. 521. You have also referred in your testimony today to a certain outside relief valve and a certain outside reservoir connected with the pipe-line of the Power Development Company plant as you found it last week. If these are shown in any of the nine photographs before us, please mark the same respectively "Air Chamber" and "Outside Relief Valve."

A. The air-chamber I have marked "Air Chamber"

in photographs "F", "H" and "G". In each of these photographs the small connecting pipes going into the upperpart of the air-chamber for maintaining the air pressure therein to provide a suitable cushion for the inertia of the water upon a change of velocity of the water in the main pipe by the hand operation of the valve is shown, and I have marked this "Air Pipe." The relief valve which I have previously testified is actuated by hydraulic connections to a hand lever mounted near the switchboard in the interior of the power house is shown on photographs "H" and "F", and I mark on each of them "Hand Operated Relief Valve." The pipe connections for operating this relief valve on each of these photographs I have marked "Operating Pipes."

Q. 522. In the testimony of Mr. Dearth he referred to the sealing-up of a certain outlet opening for an intended by-pass device in the pipe-line of this plant. Does any one of these photographs indicate the position of such sealed-up openings? If so, please designate by indicating word "Sealed."

A. I have so marked on exhibits "D" and "E" the word "Sealed" at the point near the floor where any discharge connection from the outlet which is now sealed would otherwise have discharged. I might add that the conduits for the electric wiring from the generator also pass immediately under this outlet, and their general condition would indicate that they had been in place for a very long period of time, and their position is such that they could not pass through here with pipe connections from the otherwise sealed outlet.

Q. 523. You have also testified today with respect to a certain telescope used at this plant last week and positioned so as to make possible observation of the indicator position or condition at the gate in the forebay supplying the pipe-line or penstock leading to this plant. Do any of these photographs show such telescope? If so, please indicate, writing the word "Telescope" on the mounting of the photograph, with a leading line to the instrument.

A. It is clearly shown in photograph exhibit "C", and I have marked the word "Telescope" thereon. In this photograph also appears Mr. J. F. Dearth.

Q. 524. By whom were these negatives of these nine photographs taken by you developed?

A. I had them developed and printed by a professional photographer in town here.

Q. 525. And they were received by you directly from him?

A. Yes, sir; and I know them to be in all details correct photographic prints of the negatives taken by me as previously testified.

Mr. Blakeslee: Complainant offers in evidence the nine mounted photographic prints just described by the witness and ask that the same be marked respectively "Complainant's Exhibits Power Development Company Plant A, B, C, D, E, F, G, H and I."

(The said photographic prints so offered in evidence are marked respectively "Complainant's Exhibits Power Development Company Plant Photograph A, B, C, D, E, F, G, H and I.")

insert > Q. 526. By Mr. Blakeslee: Referring now to the butterfly valve devices which you have just testified

about as being provided at the Power Development Company plant for determining the flow of water in the several wheel units, can you compare the same with any valve device shown in the Lyndon patent in suit?

A. I can. The type of valve in use as hand control valves, there being one in each of the wheels at this Power Development Company plant controlled by hand, are the same type of valves as indicated in the Lyndon Patent No. 695,220 Fig. 1 as the type of by-pass valve therein disclosed. In Lyndon Patent Drawing Fig. 1 is disclosed in "Complainant's Exhibit A." Said valve appears in the said Fig. 1 as No. 48.

Q. 527. Please now compare or contrast this type of valve with the several types of valves found in "Complainant's Exhibit Wilson Sketch A, B, C, D and E," respectively, and, if it be possible, classify all of these types of valves as you may see fit.

Mr. Westall: Objected to as not proper rebuttal and being apparently an attempt to show that the butterfly valve which is in use has a resemblance to that of the Lyndon patent, which can be of no possible pertinence to the case.

A. The structure shown in Wilson sketches A, B, C, D and E, naturally group themselves into two generic classes. The early form of water gates consisted of a slide closing and opening, which slide acted upon its seat and ~~the valve disc, making the operation erratic and~~ ^{was retained on the seat by the water}

1810 29 add "together with the title of the court and cause and the date upon which said exhibit was offered"

difficult and causing wear in the valve. This type of valve is shown in Wilson's Sketches "D" and "E" very

clearly. The operation of the disk across the seat, in order to vary the area of opening, is difficult and unsatisfactory, especially for governig purposes, in that the heavy friction element introduced by the water pressure against the sliding surfaces makes the governor move by jerks and prevents that sensitiveness and accuracy of control attainable with balanced forms of valves. The type of the valve shown as the by-pass valve in exhibit "C" is a differentiation of this sliding friction type and belongs generically to the same class, in that there are two surfaces in frictional contact at all times. The rotation of the by-pass valve in its chamber gives a metal-to-metal friction which causes jerks in the movement of the governor and prevents accurate and sensitive speed control or by-pass control, or both. The type of water gate shown in Wilson's Exhibit "C" are, on the other hand, sensitive and balanced or partially so, or may be readily balanced by external means, and as such are distinguished from the type of by-pass valve shown on this exhibit or sliding type of valve shown in "D" and "E". In Exhibit Wilson Sketch "B" both the water gates and the by-pass valve are of the balanced type and are sensitive to control of a governor and may, if designed of the proper proportions, be depended upon to operate sensitively and accurately in the governor control as distinguished from the earlier generic form of slide gates. The type of valves, both the water-gate and by-pass valve, shown in Sketch "A" are also of the balanced sensitive type. These two generic classes, that of the slide operating against a surface and heavily pressed against the said surface, whether it be a rotating form of valve as shown in Wilson's Sketch "C" or the flat

slide as shown in Exhibits "D" and "E", are inoperative for accurate governing control, whereas the generic type of valve as shown in Exhibits "A" and "B" is successful as a governing control valve or valves, in that there is no frictional resistance between the valve and its seat. The same applies to the type of valve disclosed by Lyndon in Fig. 1, "Complainant's Exhibit A," and shown thereon as No. 48.

Q. 527. Referring now to "Defendant's Exhibit Berry Blue-print No. 1," and to the valve marked No. 41 therein, does this fall within the category of either classification you have just made, and, if so, which, and for what reasons?

A. The valve marked "41" in both views of the Berry Blue-print No. 1 falls within the friction type of valve or first generic type above mentioned as being an inoperative type of valve in water wheel automatically governed machinery. This type of valve cannot possibly be depended upon in connection with automatic water-wheel control, as, if it is not inoperative in the first five minutes of its operation it will become so as soon as the surfaces have slid one over the other under the water pressure under which the valve is intended to operate, and ~~is~~ not used in any power plant, to my knowledge, for any such purpose.

Q. 528. And in using this type of valve like "41" just referred to, how does the pressure of the water intended to be controlled by the same effect such valve or act upon it?

A. The water pressure causes the valve to press heavily against its seat during all times of operation, and more especially so as it approaches its closed position.

Q. 529. What effect does that have upon the frictional conditions as between the valve and its case or seat?

A. The friction which is to be overcome in shifting the valve is proportional to the pressure of the water against the valve. It is not the case in the second generic class I have specified above, in that there is no friction between the valve and its seat at any time during its operation, regardless of the water pressure behind the valve.

Q. 530. And when, and only when, is the valve in contact with its seat in this other free moving class of valve?

A. In the free-moving or balanced class of valve the valve comes in contact with its seat only at the moment of complete closure and at no time does it rub against its seat in any sense of frictional contact.

Q. 531. In other words, the valve is only upon its seat when home, and not when moving toward home or away from home?

A. That is correct.

Mr. Westall: It is understood that in consenting to the taking of the deposition of Mr. Lyndon at this time the defendant does not waive any right he may have to cross-examine the witness W. W. Wilson.

Mr. Blakeslee: Due opportunity will be given the defendant to cross-examine the witness W. W. Wilson and the party Henry.

Los Angeles, Mar. 5, 1915, P. M.

LAMAR LYNDON, produced as a witness on behalf of complainant, being first duly sworn according to law, testified as follows, in rebuttal:

DIRECT EXAMINATION

By Mr. Blakeslee:

Q. 1. Please state your full name, age, residence and present occupation, Mr. Lyndon.

A. Lamar Lyndon; age, forty-three years; residence, New York; occupation, consulting engineer.

Q. 2. How long have you been engaged in your practice as consulting engineer?

A. Since 1900.

Q. 3. What if any academic and practical training did you have fitting you for such practice?

A. My technical education comprised four years in the University of Georgia, from which institution I graduated with the degree of Bachelor of Engineering; after which I went to the Stevens Institute of Technology to study mechanical engineering and from there I went to Cornell University to study electrical engineering, thus having spent nearly eight years in technical schools. After leaving Cornell I was manager of the Thomas Bailey Iron Works of Athens, Georgia, which position I left to take that of engineer for the Athens Gas & Electric Company. The plant which we operated was a water-power plant with a steam auxiliary. I left the Athens Gas & Electric Company to become associated with Her-rick & Burke, consulting engineers, in New York. In

1896 I went abroad for an American syndicate, and was gone for about two and a half years, during which time I was principally in Japan. I returned to America in the spring of 1898, the date of my arrival in New York being May 28, 1898. I came back to assume the duties of chief engineer of the American Trading Company, and continued with that company until 1900, after which I went to Baltimore on some special work and at the end of 1900 returned to New York and there entered into practice as consulting engineer, in which work I have since continuously been engaged.

Q. 4. Have you ever received any letters patent of the United States for any invention?

Mr. Westall: Objected to as incompetent, irrelevant, immaterial, unless it is limited to some invention within or alleged to be within the issues of this case.

A. Yes.

Q. 5. By Mr. Blakeslee: How many such?

Mr. Westall: Objected to for the same reasons as before stated.

A. My present memory is eighteen.

Q. 6. By Mr. Blakeslee: Can you state from your memory the subject of a number of the inventions covered by such Letters Patent or for which you obtained such Letters Patent?

Mr. Westall: The same objection.

A. One patent for an electrical thermostat, three patents on speed control of prime movers, five patents on train lighting systems, three patents on boosters for the regulation of storage battery charge and discharge, one patent on automatic end cell switches for storage bat-

teries, one patent on storage battery plates, two patents on means for charging storage batteries from alternating current, one patent on rheostats. That is about all I remember. These cover all that I can recall at present.

Q. 7. By Mr. Blakeslee: Can you mention any particular inventions for which you have received such patents relating to the regulation of speed of prime movers, referring particularly to the general nature of such inventions.

A. The three patents relating to speed control of prime movers cover specifically the speed control of water wheels. The first of these, which was the second invention that I ever patented, is the patent here in suit; and this was followed by two others, one of which related to certain changes in detail of the first one mentioned, and the other covers an entirely different means of speed control from that disclosed in the first named patent.

Q. 8. You have referred to the invention disclosed and patented in and by the second patent issued to you, namely the patent here in suit. Can you give approximately a date corresponding to the inception of your conception of the invention of that patent?

Mr. Westall: Objected to for the reason that it has not yet appeared that the witness knows what patent is in suit.

A. It is impossible for me to say at what date the conception of this invention came to me. I know that the principle of using a variable voltage generator for supplying current to an electromagnet as a means of control, came to me prior to my return to America, and, therefore, prior to the spring of 1898. Also, the pro-

vision for the returning device followed very closely on the first conception of the use of a variable voltage dynamo with a solenoid supplied from it, as a speed-control mechanism. The invention, however, was not completed until the month of June, 1898. The particular day or date in that month I do not remember, and I am only able to fix the month by certain collateral facts. This final portion of the invention was the application of the by-pass valve moving inversely to the motion of the water-wheel gate, actuated by the governing mechanism, and, after governing was completed, arranged to be returned slowly to its normal position. I have already made an affidavit in which I have set forth, approximately, the time and the manner in which this portion of the invention was made. All the other portions were made prior to that time, and as far as I am now able to recall, the original inception of the variable voltage principle for speed control was at least six or eight months prior to June, 1898.

Q. 9. By Mr. Blakeslee: And what month of what year was it that this invention, as disclosed by said patent sued on in this case, was and had been completely conceived of by you?

A. The month of June, 1898.

Q. 10. I show you "Complainant's Exhibit A," and ask you if you know anything about it, and, if so, state what.

A. This is a copy of Letters Patent No. 695,220 granted to me and covering the essential features of water-wheel governors which I had invented and which invention was completed prior to July, 1898.

Q. 11. What if any connection is there between that

Letters Patent and the Letters Patent you have mentioned as being that sued on herein?

A. I understand that the patent sued on in this case is this same patent, No. 695,220.

Q. 12. Have you had any actual experience in connection with the art of hydro-electric power generation?

A. Yes; both in this country and abroad, and my work for the past few years has been almost entirely in hydro-electric development.

Q. 13. Have you been more recently connected with any hydro-electric power project? If so, please describe it and locate it.

A. I have just finished the work of construction of a hydro-electric plant on the Colorado River at Austin, Texas, acting as consulting and designing engineer on the work. This construction has been in progress for nearly four years and the dam, and artificial body of water which it forms, are among the largest in the world. The head obtained by the dam is used for power purposes, and the power plant comprises a full equipment of electric generators driven by water wheels, and the speed is controlled by water-wheel governors with the usual accessory electrical and mechanical apparatus.

Q. 14. What type of water-wheel governors are used in that plant?

A. Lombard oil-pressure-actuated governors.

Q. 15. Do you know who manufactures and supplies to the market this Lombard governor, and, if so, state.

A. The Lombard Governor Company of Ashland, Massachusetts.

Q. 16. Please identify several of the interests which you have advised or with whom you have been associ-

ated as consulting engineer during your experience in that practice.

A. Beginning with the Athens Gas & Electric Company and the construction of the water-power plant there, with the water-power plant in Japan, near Lake Biwa, the name of which I do not now remember; with several projected plants among which were that at Gainesville, Georgia, on the Chattahoochee River, one below Mechanicsville, Alabama, on the same river, and one below Calhoun Falls, South Carolina, on the Savannah River, and a water-power plant which I constructed at Boonton, New Jersey, on the Rockaway River; investigation of water-power plant at Bristol, Tennessee; one at Clifton, Ohio; one near Columbia, South Carolina, on the Saluda River, and my last connection was with the development at Austin, Texas, about which I have previously testified. The others I do not remember; but I think that is sufficient.

Q. 17. In your engineering practice have you been associated with other engineers? If so, please identify them with respect to their work and position in the engineering field.

A. I worked for a while with Elmer A. Sperry as an associate in the development of the Sperry-Lyndon system of train lighting, which was sold to the National Battery Company, now the United States Heating & Lighting Company of Niagara Falls, and I was a partner in the firm of Duncan & Lyndon, which firm was composed of Dr. Louis Duncan, past president of the American Institute of Electrical Engineers, and myself. As far as I now recall, these were the only two associations which I have had with other engineers. The position of Mr.

Elmer A. Sperry is well known in the electrical art. He was one of the pioneers in arc lighting, being the designer of the old National Electric Company of Chicago. He also developed the Sperry electric railroad system, and the Sperry electric brake, and the patents on electric railway devices were finally sold to the General Electric Company for a sum which I have been informed by Mr. Sperry was \$219,000. Mr. Sperry has, since my association with him, been active in the development of the gyroscope for the steadying of ships, and, as I believe, acquired considerable reputation both in America and abroad in this line of effort. Dr. Louis Duncan is considered by European scientists and engineers to be the foremost man in America in his line, and he has had for many years a reputation of the very highest character. For twelve years he was Professor of Electrical Engineering in Johns Hopkins, and for three years was Professor of Electrical Engineering at the Massachusetts Institute of Technology. He is past president of the American Institute of Electrical Engineers and a member of the Mathematical Society of France. He developed the underground trolley and made traction without the use of overhead wires possible by his development in this branch of the art, and was the first engineer to reduce heavy electric traction to commercial practice on the Baltimore & Ohio Railway in the tunnels at Baltimore.

Q. 18. After the completion of your conception of the invention disclosed and patented in and by your patent No. 695,220, as per "Complainant's Exhibit A," which is a copy thereof, sometime prior to the 1st of July,

1898, what did you next do in and about or concerning that invention in any respect?

A. I attempted to interest manufacturers in it with the intention of inducing them to make and sell the water-wheel governor which I had invented.

Q. 19. Prior to such attempts did you at any time disclose this invention to any other person or persons?

A. Yes.

Q. 20. When did you make such first disclosure, and to whom, and state the circumstances.

A. The first disclosure of the complete invention was made to Henry C. Meyer, Jr., of New York, in the City of New York, and sometime during the month of June, 1898. Very soon thereafter, and during the year 1898 but at times which I cannot now fix except approximately, it was disclosed to a number of other people who were engineers that the company which I was then associated with was doing business with, or who were my personal friends.

Q. 21. That goes a little beyond the question, and I will ask you to state more fully the circumstances surrounding this first disclosure to Mr. Meyer, fixing the time as accurately as you can, and the place, and stating what transpired on the occasion of this disclosure to Mr. Meyer.

A. As I have stated in an affidavit which I made concerning this matter, Mr. Meyer was a classmate of mine in the class of 1892 at the Stevens Institute of Technology, and at the time I returned to America was one of the editorial staff of the Engineering Record which journal was then owned by his father, Henry C. Meyer, Sr. The offices of the Engineering Record were in the

Woodbridge Building, at 100 Williams Street. The offices of the American Trading Company, with which company I was connected, were in the same building. The same friendly and cordial relationship which had existed between Mr. Meyer and myself during our student days at the Stevens Institute, were still sustained when I returned to America. In fact, we had kept up a fairly active correspondence during the entire time of my absence abroad. It was our custom, as nearly as our business arrangements would permit, to take lunch together every day, usually at the lunchroom called the "Westchester," which was diagonally across the street from the Woodbridge Building on Williams street. One day I outlined to Mr. Meyer the idea which I had with regard to a proper method of speed control of water wheels, beginning with the idea of a controlling dynamo in which the voltage would vary at a more rapid rate than the speed variation of the dynamo, a solenoid, the pull on the plunger of which would vary more rapidly than the electro-motive force impressed at the terminals of its windings, means of preventing governor over-running, by the application of an additional force to that set up by the magnetic force of the solenoid, and the application of which additional force would always be in a direction opposite to the tendency of motion of the solenoid, and means for preventing the governor from overrunning—that is, going past the proper position of gate-opening—which means comprised simply limit stops which would open contacts in the electrical circuits through which the electro-magnetic actuating parts of the governor were energized. These features were discussed between us, and I remember pointing out

to Mr. Meyer that one of the objects which I desired to obtain was a rapid movement of the water-wheel gate. Mr. Meyer stated that an excessively rapid movement would not produce the conditions of good governing, which I had hoped to obtain, by reason of the inertia of the column of water and the stored energy in it. It was at that time that the idea of the by-pass valve arranged to move in a direction opposite to the direction of motion of the main valve occurred to me, and I then made a rough sketch of the device, describing it, with the assistance of this sketch, to Mr. Meyer. It was on that date, and at that specific time, that the invention as disclosed in the patent here in suit was completed, so far as my conception of it is concerned.

Q. 22. How much of such conceived and invented matter did you disclose to Mr. Meyer, Jr., at that time? That is, the matter which you have recited in your last answer.

A. I disclosed to him the variable voltage methods by which electrical contacts would be made or broken, depending on the speed of a small governor generator.

Q. 23. (Interrupting) Pardon me. I think I can shorten your answer by putting the question this way, the answer not being responsive to the question, and I therefore break in upon the answer: Please state what part of such matter you disclosed, whether in toto or only part, and referring to the matter of your answer referred to last.

Mr. Westall: I object to counsel interrupting the answer of the witness to the question, which answer was clearly responsive, and by which interruption he evi-

dently expects to forestall something that is not entirely favorable.

Mr. Blakeslee: The propriety of the proceeding speaks for itself. The answer was not responsive.

A. It is difficult to say, absolutely, that I disclosed to Mr. Meyer all of the details of this invention. The salient features of voltage control, and method of preventing overrunning, and the by-pass valves, were disclosed to him. I do not remember whether or not I disclosed the method of preventing over-travel of the governor. By this I mean an attempt of the governor to move the gates after they had been fully opened or fully closed, as far as it was possible for them to go. The reason why it is probable that some of the detailed methods by which I expected to accomplish certain of the results were not gone into at that specific time with Mr. Meyer, is, that many of the details of any mechanism are sufficiently obvious to a trained engineer to make it needless to discuss them. For instance, the fact that the operation of the governor in any one direction must cease after the gates are fully moved in that direction as far as they will go, is an obvious mechanical condition; and in discussing important and new features and combinations, it is probable that such a detail as this might not have been mentioned, although I cannot say definitely that I did omit even to mention this to Mr. Meyer. My memory at this time is definite only on the points that I disclosed to him, the salient features which I have already mentioned as having sketched out and discussed with him.

Q. 24. And in your disclosure to Mr. Meyer at that

time what was to be the nature and arrangement and province of the by-pass valve you have referred to?

A. I remember a phrase which I happened to use at the time, and I remember it because I have used it so often since in explaining the action of the governor, as it seemed to me to most concisely describe one of the most important features. That was, that I stated that I had transferred the time element necessary for acceleration and deceleration of the column of water, from the water-wheel gate to the by-pass valve.

Q. 25. What would this transferring of the time element to the by-pass valve require as to the arrangement and movement of the by-pass valve?

A. It would require that in closing the water-wheel gates rapidly, that is, more rapidly than the column of water could be retarded without setting up comparatively high pressures in the penstock and turbine casing, the by-pass valve would have to open, and open at some rate which would be related to the rate of closing of the main gate. After the governing action would be completed this would leave the by-pass valve open and water flowing through it, and provision would have to be made whereby the by-pass valve would then return to its normal position, and in returning, its rate of motion would have to be substantially slow enough to allow the column of water leading to the turbine casing and to the by-pass valve to diminish gradually in velocity and at a sufficiently gradual rate of diminution in velocity, as to prevent the production of any comparatively high or excessive pressures in the penstock and wheel case.

Q. 26. And how, similarly, with respect to the by-

pass in connection with moving the water gate in an opening direction?

A. In the case where an ample supply of water is available, and by that I mean a sufficient amount of water not only to supply the power requirements of the plant which is actuated by the water supply, but also a sufficient quantity of water in addition to allow the continuous efflux of a certain proportion of the whole amount, the preferred normal position of the by-pass valve would be in a half-open and half-closed position.

Q. 27. And that is the position to which the by-pass valve would return, subsequent to a completed governing action?

A. When set for that position, it would.

Q. 28. And how would the normal position of the by-pass valve be predetermined in any particular installation?

A. At periods when ample supply of water would be available the normal position for which it would be set would be half-open and half-closed. At periods when the water supply would be low the by-pass valve would be set normally closed, and then could move only to open the gate and relieve internal pressures which might be set up, due to rapid closure of the water-wheel gates. This would be a general statement of conditions. Of course, these general conditions are subject to modifications for any specific conditions of plant. For instance in the case of a pipe-line in which the slope was very small, the rate of acceleration of the column of water in case the water-wheel gates were quickly opened would be slow, in which case it would be more desirable to have

a continuous flow through the by-pass valve whenever a sufficient amount of water would be available for this purpose, than when the slope of the penstock would be high. For a rapid penstock slope or for the case of maximum slope, namely, a vertical penstock, the rate of acceleration of the water is, of course, more rapid for a given mass of water and length of penstock than when the slope is small. In that case there is scarcely any advantage to be derived from having the by-pass valve kept partly open, even when an ample supply of water is available, for the reason that the rate of acceleration of the column of water is sufficiently great to keep pace with the rate of opening of the water-wheel gates. On the other hand, in the case of a penstock having a rapid slope, or being set vertically, it is imperative to have some means for relieving the pressures set up, due to sudden closing of the water-wheel gates. And from these considerations it follows that under the conditions of rapid slope of penstock, the normal condition for which the by-pass gate would be set, would be the closed position. All of these considerations were duly entered into between myself and the patent attorneys, Messrs. Knight Brothers; and also, they were given due consideration when this matter was first brought before Mr. Thorburn Reid, acting for the American Impulse Wheel Company, and later with Mr. Thomas Shipley, general manager of the York Manufacturing Company.

Q. 29. In what connection did you bring up these matters which you have mentioned with Knight Brothers, the patent attorneys you have mentioned?

A. In connection with the fundamental character-

istics of an invention that I desired then to cover in drawing patent specifications and claims.

Q. 30. And what patent specifications and claims do you refer to?

A. For the patent in suit in this case.

Q. 31. You have referred to a returning device for preventing the governor from overrunning, and you have also referred to the cut-out means or stop means for preventing the governor mechanism from traveling too far, so as to jam the water-wheel gates, for instance. Are we to understand that these features were the same or different in your invention as disclosed to Mr. Meyer at the time you have stated, and later disclosed in your patent, namely, the patent in suit.

A. These features are in no wise different from those which I had in mind when I disclosed this entire invention to Mr. Meyer.

Q. 32. What I mean is, were these features identical each with respect to the other? Or were they different each from the other? That is, was there one such, or were there two such features?

A. They were totally different, if I understand your question correctly. The device preventing overrunning of the governor was self-contained and complete in itself and independent of any device for preventing over traveling of the governor.

Q. 33. And the over-travel of the governor was to be prevented for the purpose of eliminating any possibility of the water-gate jamming?

A. That is correct. The means for preventing over-travel was possibly a later addition to the original invention. That I do not now recall. I do know that even

at the present time on commercial water-wheel governors it is necessary in plants to add some means for preventing over-travel even after the governor is purchased and installed, which is not an intrinsic portion furnished by the governor builders.

Q. 34. Those are in the nature of stop means or limit means?

A. Yes.

Q. 35. Do you know who is the owner at the present time of the Letters Patent in suit as per "Complainant's Exhibit A?"

A. I understand the owner to be Mr. George J Henry, Jr. At any rate, he purchased this patent and came in possession of it at one time.

Q. 36. Do you mean the complainant in this case?

A. Yes, sir.

Q. 37. From whom did he purchase this patent, if you know.

A. He purchased it direct from me.

Q. 38. Have you any interest, whatsoever, in that patent at the present time?

A. None at all. The transaction was a straight-out purchase, without any obligation on either side as to the future, in any way.

Q. 39. Have you any contingent interest of any nature in this present suit, or any suit to be brought under this patent?

A. None whatever.

Q. 40. Are you under any binding legal obligation to testify on behalf of complainant in this action?

Mr. Westall: I object to the question as calling for

a legal conclusion and a knowledge of law which it has not been shown the witness is qualified to give.

A. No.

Q. 41. By Mr. Blakeslee: Now, how specifically can you state the time at which this disclosure to Mr. Meyer took place in the Westchester restaurant in the year 1898, at which time you disclosed the invention of the patent in suit, as you have recited, to Mr. Meyer?

A. I can only fix it as prior to the time that I left New York in July, 1898, to go to Athens, Georgia.

Q. 42. What part of the month of July was it when you went to Athens, Georgia?

A. I believe it must have been after the middle of the month.

Q. 43. Then this disclosure took place, if I am correct, between the 1st of June and the last of July, 1898. Is that correct?

A. Yes.

Q. 44. And at that time did you in any other manner than verbally disclose or assist disclosures of your invention to Mr. Meyer?

A. Yes. I made a sketch at the time that I first made this disclosure to him at the time when we were at lunch together at the Westchester restaurant, and which time I fix by reason of several collateral circumstances to be during the month of June, 1898.

Q. 45. Have you any of the sketches made at either of these times?

A. No. The first sketch, I remember, was made on the back of the restaurant bill-of-fare, possibly reinforced by other sketches on the tablecloth.

Q. 46. Do you know what has become of any of these

sketches, and, particularly, those that you made at the time of your full disclosure prior to the last of July, 1898, at the Westchester restaurant?

A. No. These sketches were all roughly made at the moment, and made for the purpose of explaining the particular characteristics of the invention, and at that time I had no knowledge of the importance of retaining the original sketches which might be made of an invention.

Q. 47. Can you, generally, reproduce these last sketches last mentioned at this time?

A. I could, but I would not at this time remember whether they looked like the sketches which I made fifteen years ago to show Mr. Meyer how the proposed device would operate.

Q. 48. When you say "fifteen years ago," do you mean to be specific or general?

A. Simply general as indicative of a considerable lapse of time since the original sketches were made. As a matter of fact, it is nearer seventeen years ago than fifteen.

Q. 49. Now, did these sketches made at that time for Mr. Meyer go into minutes¹⁰² and specific details, or did they indicate the several elements in kind, or how fully did they illustrate and assist the disclosure made verbally by you to Mr. Meyer?

A. They illustrated only the salient principles of the device and the general methods by which the object which I sought to attain would be obtained in an operating machine.

Q. 50. And because of Mr. Meyer's engineering and technical ability, was it necessary to go into details as to

the construction of by-passes, dynamos, solenoids, etc. in such sketch disclosures?

A. No. As I have stated, Mr. Meyer was a graduate then of six years' standing, from the Stevens Institute of Technology, and was one of the editorial staff of a technical journal of high order, and, necessarily, possessed of mental training and capacity to understand that if a mechanical or electrical principle were shown him there might be a multitude of ways by which the principle might be made operative for a useful purpose.

Q. 51. Was Mr. Meyer's mentality of a nature which would readily receive and retain impressions or disclosures of the nature you have stated you gave him?

Mr. Westall: Objected to as calling for opinion evidence upon a matter of psychology, rather than a matter of fact, in the issues of this case.

A. My knowledge of Mr. Meyer and my association with him, extending over a number of years, enables me to give a very definite reply. His mentality is such that if he once receives an impression it is, as a general thing, permanent with him. Furthermore, in his capacity as one of the editorial staff of *The Engineering Record*, he had had a number of years' experience in receiving and setting down technical impressions. These factors, of course, were reinforced by the training which he received in Stevens' Institute of Technology, and he has since shown himself by engineering work he has done to be a man having a high order of mentality. He has been for some years consulting engineer for all of the steamship lines owned by the American

Line coming into New York Harbor. He is the engineer selected by the United States Government to rebuild and rehabilitate the entire power plant and heating and ventilation system of the U. S. Military Academy at West Point, and is one of the consulting engineers for the office of J. P. Morgan & Company of New York.

Q. 52. By Mr. Blakeslee: Will you please, before appearing to further testify here tomorrow morning, reproduce as closely as you can the sketches which you made on the occasion of your full disclosure as testified of the invention of the patent in suit to Mr. Meyer at the Westchester restaurant in 1898, which sketches you made in connection with your said disclosures of the invention, and produce the same at this place.

After your recited disclosures in respect to this invention to Mr. Meyer, did you disclose the invention to any other person prior to taking steps looking to the manufacture of the governor mechanism? And, if so, please state to whom next in order, when, where and the surrounding circumstances.

A. I am not able to say who was the next person after Mr. Meyer to whom I revealed this invention. I saw Mr. E. A. Merrill frequently, as we had certain business negotiations at that time that required us to meet very frequently, and I at one time and at one of those meetings disclosed the invention to him. I am not able to say, however, whether this disclosure to Mr. Merrill was prior to or subsequent to the disclosure to Mr. Thorburn Reid. I used to see Mr. Reid very frequently, and his assistant, Mr. Richard R. Bryan, and to both of these

gentlemen I not only disclosed the invention, but discussed with them details of the best methods of machine design and materials to use in reducing this invention to practice.

Q. 53. Where was your home at this time, namely, in the summer of 1898?

A. My home was in Athens, Georgia. That is to say, that is the place that had been my home until my departure for Japan,

Q. 54. Did you at any time return to your home in Athens, Georgia, after returning from Japan in the spring of 1898?

A. Yes. I went to Athens sometime during the month of July, 1898.

Q. 55. And how long were you there?

A. I don't remember, but I think it was three or four weeks or possibly longer.

Q. 56. During your stay at your home in Athens, Georgia, at that time, did you disclose the invention which you disclosed to Mr. Meyer previously, or any part of that invention, to any person?

A. Yes.

Q. 57. Whom?

A. To my brother, Mr. Edward Lyndon, who at that time was a student in the University of Georgia.

Q. 58. Can you go farther and state any circumstances surrounding or pertaining to such disclosure to your brother at that time?

A. It had been about two years and a half, or possibly more, since I had seen my brother, and at the time that I saw him he was then, if I remember rightly, in

the Junior class at the University of Georgia, and was not only then very much interested in the engineering subjects that he was studying but for years prior to his entrance into the University had been interested in mechanical and electrical principles and devices. In addition to that, our family owned certain works that used machinery, and he had been accustomed to machinery and mechanical devices from his early boyhood, so that he was mentally equipped to receive this disclosure and to appreciate all of the factors which pertained to this device, and was at a receptive age when such a disclosure would make an impression on him. Furthermore, my home-coming, after so long a period away and having been such a great distance from America, was another circumstance which would fix the time of this disclosure, both in his mind and in mine. I am under the impression that I also disclosed this at the time to others in Athens, and I think to the then Professor of Engineering in the University of Georgia. But of that I am not now sure.

Q. 59. How fully did you disclose this invention under discussion, to your brother while at home on the occasion of this visit, with relation to the fullness of disclosure which you have received as having made to Mr. Meyer shortly previously at the Westchester restaurant in New York?

A. I know that I disclosed to my brother all of the parts and functions that I did to Mr. Meyer, and I am under the impression that at that time I disclosed to him also the limit stop-device in addition to the other features of the invention.

Q. 60. Did you make any sketches in connection with your disclosure to your brother at that time?

A. I do not remember any sketches, but I know that I must have made them as there was no other way in which I could have disclosed it to him.

Q. 61. Have you any such sketches in your possession or under your control at this time?

A. No; I have not. In fact, many of the working sketches and computations which I later made in connection with the design of the apparatus I have not in my possession.

Q. 62. You have referred to your return to New York on May 28, 1898. Do you remember the steamer upon which you returned and the port from which you sailed to New York on that steamer?

Mr. Westall: Objected to as immaterial.

A. Yes.

Q. 63. By Mr. Blakeslee: What steamer was it?

A. We sailed from Liverpool on the Teutonic of the White Star Line.

Q. 64. And have you taken any steps recently to determine by any record or memorandum the date of the arrival of that steamer at New York? And, if so, in what manner?

A. There are certain—not specific records—but matters which I have been able to refer to which fixes the arrival as the late afternoon of May 28, 1898.

Q. 65. What would you fix as the approximate time of your return to New York from your home in Athens, Georgia, in the summer of 1898, if you so returned.

A. During the month of August. At what part of

the month I cannot say, except inferentially. I would say it was sometime between the 10th and the 20th of the month.

Q. 66. And that was subsequent to your disclosure of the invention to your brother?

A. Yes.

Q. 67. Now, with reference to your return to New York City in August, 1898, when was it that you discussed the invention under consideration with Mr. Thorburn Reid?

A. My present memory is that I discussed the matter with Mr. Reid to some extent before I left New York, and that it was after I returned to New York in the latter part of the summer of 1898 that I took up the subject of the manufacture of water-wheel governors, under my invention, with Mr. Reid.

Q. 68. With what, if any, interests was Mr. Reid associated at this time?

A. He was consulting engineer of the American Impulse Wheel Company of New York. Their office was at 120 Liberty Street.

Q. 69. And was it in connection with Mr. Reid's association with this company that you discussed this invention with him?

A. My first disclosure to him was in the nature of simply a conversation, without any business expectations—merely a discussion between engineers of a proposed new method of accomplishing a desired and, up to that time, unaccomplished object. Later I brought it to the attention of the American Impulse Wheel Company, through Mr. Campbell, whose initials I do not now re-

member, and who was either president or vice-president of the American Impulse Wheel Company, and he naturally referred the matter to Mr. Reid who was then consulting engineer of this company.

Q. 70. Did Mr. Reid render any conclusions or report with respect to this invention so submitted to his company and to him?

A. I have no means of knowing what Mr. Reid might have reported to the American Impulse Wheel Company.

Q. 71. Did Mr. Reid state to you any findings with respect to the merits of your invention?

A. Yes. He told me that in his opinion the invention was a good one, and, a well-designed machine which would incorporate in it all the factors and produce the various results outlined, would be a desirable one, and, probably, the manufacture of it would be a good commercial venture. It was about this time, however, that the relations between Mr. Reid and the American Impulse Wheel Company ceased, and Mr. Campbell decided that he would not go any further into the manufacture of hydraulic machinery of any character. So that these negotiations came to an end, and I think, somewhere about December, 1898.

Q. 72. Referring to the first discussions, or earlier discussions which you had of such invention with Mr. Reid, did they take place subsequent to or prior to your disclosure of the invention at the Westchester restaurant to Mr. Meyer, before the end of July, 1898?

A. They were subsequent to the disclosure to Mr. Meyer.

Q. 73. And how did such discussions with Mr. Reid

compare as to the general field of disclosure of such invention with the disclosure made at the time last mentioned to Mr. Meyer?

A. It would be difficult to say. I made a full disclosure to Mr. Meyer of the fundamental characteristics of this device. It is probable that in discussing the matter with Mr. Reid the commercial form of machine took more definite shape, and that the possibilities of different characters of materials were more fully discussed. I recall a discussion—not with Mr. Reid, but with Mr. Reid's assistant, Mr. Bryan,—about the question of material for the friction surfaces and the possibility that I then feared that if made of metal, incidental or accidental lubrication of these surfaces might so change the co-efficient of friction as to be injurious to the operation of the machine, and, therefore, I considered that some other form of friction surface might be desirable, and Mr. Bryan suggested the use of wood with the end grain exposed to contact with metallic discs.

Q. 74. In connection with your recited disclosure or disclosures of your invention under discussion to the American Impulse Wheel Company, and its Mr. Campbell and Mr. Reid and Mr. Bryan, did you or did you not submit any sketches or drawings disclosing said invention?

A. I made sketches, but at the time did not submit any drawings, as it was my view that the actual shop drawings and the details of design would be worked out jointly by Mr. Reid and myself. At the time of this disclosure to Mr. Reid, a Mr. Van Dyke was general manager of the American Impulse Wheel Company, and he

also knew of this invention. Mr. Van Dyke has been in Europe, and he returned not long ago.

Q. 75. How shortly after your said return from Athens, Georgia, did you take up this matter of your said invention with the American Impulse Wheel Company?

A. It must have been very soon after my return, but just when, I now have no means of knowing.

Q. 76. Can you place a limit upon the time in weeks?

A. I should have said it was certainly within three or four weeks.

Q. 77. And that would be from the middle part of August, 1898?

A. It was sometime certainly not later than the month of September, 1898.

Q. 78. Now, as to your discussions of the invention with Mr. Merrill, to whom you have referred, about when did they take place, if you can remember.

A. I should say that they were some time between the first of September and the end of 1898. That is as clearly as I at the present time remember when that disclosure took place. I know that at the time of my arrival in America there were business relations between the McIntosh & Seymour Company, which company Mr. Merrill represented in New York, and the American Trading Company, of which company I was chief engineer, with reference to some large vertical engines that would be built for Japan and be shipped there, and I know that I met Mr. Merrill very soon after my return to America and I feel certain, without being able in any way to prove the certainty thereof, that it was prior to my going to Athens, Georgia.

Q. 79. Have you in your possession or under your control any of the drawings or sketches submitted by you in connection with the disclosure of your invention to the American Impulse Wheel Company and the persons whom you have spoken of as being connected therewith?

A. No, none.

Q. 80. Do you remember the name of any other person to whom you disclosed this invention at or about the times of the disclosure to Messrs. Reid, Merrill, Meyer and others?

A. I have already mentioned Mr. Van Dyke of the American Impulse Wheel Company and Mr. Campbell, and I also disclosed the invention to Mr. Aubrey H. Martin of New York, and to Mr. Frank A. Wunder who was then manager of the New York and export offices of the Ft. Wayne Electric Company, and also to other persons whose names now escape me.

Q. 81. About when was it that you made such disclosure to Mr. Martin?

A. I am not sure. It was certainly in the year 1898, but at what time during the year I cannot now be sure. I know that very shortly after my return I met Mr. Martin again. I know that it was prior to November, for these reasons: On my return to America I rented a house in New York on Seventieth Street, the number of which I do not now remember, but it was one door removed from West End Avenue. That house I had temporarily, until sometime in October. Mr. Martin was at that house several times, and, therefore, my meeting with him and my disclosure to him was prior to November, 1898.

Q. 82. How fully did you go into the matter of this invention with Mr. Martin in these disclosures?

A. Well, I disclosed the nature of the invention to him. It was a matter which interested me very greatly, and all the features of it appeared to me to be important and new in the art, and whenever I came in contact with an engineer who understood these matters I took the opportunity to discuss it with him in all its details. And without being able to say specifically what I said to Mr. Martin, I know that I revealed it to him fully.

Q. 83. And was your first disclosure to Mr. Martin of the invention under discussion prior to or subsequent to your disclosure to Mr. Meyer at the Westchester restaurant before the end of July, 1898?

A. It was subsequent to my disclosure to Mr. Meyer.

Q. 84. Did you make any sketches of the invention under discussion to Mr. Martin at any time when you disclosed the invention to him?

A. Without remembering about the sketches, I know that I must have made them for him, because there was no other way in which I could have made clear to him the very features that I wanted him to understand and that I wanted to discuss with him.

Q. 85. Have you any such sketches in your possession or under your control at the present time?

A. No; I have not.

Q. 86. What was the final decision of the American Impulse Wheel Company with respect to exploiting your invention?

A. That they would not attempt to produce and market it, for the reason that they intended to also give

up the manufacture of the impulse wheel which they were then making.

Q. 87. And for that reason would not go into the governor field?

A. Would not go into the governor field nor the manufacture of any other hydraulic machine.

Q. 88. After this negotiation with the American Impulse Wheel Company, did you take any further steps looking to the exploitation or manufacture of your said invention? And, if so, when next, and what are the facts regarding such steps?

A. The next effort I made to have a company undertake to manufacture and sell this device was when I approached the New York and the Export representative of the York Manufacturing Company of York, Pennsylvania. This representative was Mr. David S. Hays.

Q. 89. How did you get in touch with the York Manufacturing Company?

A. The American Trading Company was doing certain export business with the York Company through Mr. Hays, and at that time the York Company was manufacturing almost exclusively ice-making and refrigerating machinery. Mr. Hays told me that it was the intention of the York Manufacturing Company to make a line of turbine water wheels, and to that end had retained the services of Mr. McCormick, who had designed a number of turbine water wheels for other manufacturers in that general section of Pennsylvania. I suggested to Mr. Hays that if the York Company intended to engage in the manufacture of hydraulic machinery,

that it would be desirable for it to manufacture a water-wheel governor, and further suggested that his company manufacture a governor in accordance with my invention and on a royalty basis. After several interviews, Mr. Hays concluded that this suggestion was a good one and, in accordance with this conclusion, placed the matter before his principals at York. Later, Mr. Thomas Shipley, the general manager of the York Manufacturing Company, came to New York, and I had an interview with him concerning this same subject. After some negotiations they undertook to make shop designs for a governor which would be and act in accordance with my invention, and, I believe, began work on these designs very shortly after we had reached an agreement. The work in the draughting room of the York Company, in the laying out of ^{work}~~machinery~~ of the kind that the company was then manufacturing, became so great that they were forced to put aside the design of this new machine for a while, and the work of design therefore dragged over a considerable period of time; but how long, I am not able from memory to say, but I believe the records of the York Manufacturing Company as shown in the copies of letters to me, which I have, will indicate over how long a time the production of these drawings was protracted.

Q. 90. Approximately when was it that you took up this matter with the York Manufacturing Company through Mr. Hays?

A. I do not now remember, but I believe it was early in the year 1899.

Q. 91. About what month?

A. I could hardly say now, but I believe it to have been in January or February.

Q. 92. It was certainly early in the year?

A. It was prior to the summertime, but I do not now remember. It might have been in the early spring.

Q. 93. How soon thereafter did you take up the matter with this company through Mr. Shipley?

A. That I do not remember, but I think that is indicated by the letters which I have just referred to.

Q. 94. Can you produce the copies of letters which you have just referred to as passing between yourself and the York Manufacturing Company in connection with your said invention in 1899?

A. I can produce copies of letters which went from me to the York Manufacturing Company, but not any of the originals of ~~my~~^{any} letters from the York Manufacturing Company to me.

Q. 95. And for what reason?

A. I have not kept any of the records, because when I moved my office to No. 2 Rector Street, I destroyed a number of boxes of old correspondence and sketches, relating not only to this device but to many other things, not having any idea at that time that they would ever possess any future value, and I desired to get rid of all the papers for which I had no apparent use. Later, when the partnership between Dr. Louis Duncan and myself was formed and I moved from No. 2 Rector Street to No. 56 Pine Street, I made a similar cleaning-out of all papers, sketches and documents, the usefulness of which I then considered had passed, and some three years after that when the partnership between

Dr. Duncan and myself was dissolved and I moved to my present offices at No. 60 Broadway, I went through the process of again clearing out all of the old papers and sketches that I thought would be of no further use, so that any of the old sketches that I may have that relate to this governor are very few, and my possession of them at this time is accidental. There are a few of the original sketches which I made for the York Manufacturing Company to guide their draughtsmen that are still in existence, and the only reason why these happen to be now available is that they were overlooked in the clearing-out process which I have just mentioned.

Mr. Blakeslee: Let it be noted that the witness produces a number of purported copies of letters passing between Mr. Thomas Shipley and Mr. David S. Hays and the York Manufacturing Company, as represented by these gentlemen, and between the York Manufacturing Company and its representatives or officers and Mr. Lyndon, to which is attached what purports to be an affidavit by one Thomas Shipley, which we will ask the Examiner to mark as "York Manufacturing Company Correspondence and Affidavit of Thomas Shipley, for Identification."

(The said documents are so marked.)

Q. 96. By Mr. Blakeslee: Can you likewise produce the early sketches which you have referred to as having been furnished by you to the York Manufacturing Company?

A. (The witness produces a group of sketches, to which is attached what purports to be an affidavit by the witness.)

Q. 97. Can you also produce any drawings or blue-

prints or the like, if such were made, by the York Manufacturing Company, in connection with your dealings with them pertinent to your said invention?

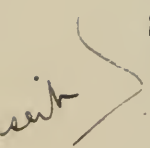
A. (Witness also produces a group of blueprints attached to the papers marked "York Manufacturing Company Correspondence and Affidavit of Thomas Shipley for Identification.")

Mr. Blakeslee: We offer in evidence the group of blueprints last mentioned and the papers marked "York Manufacturing Company Correspondence and Affidavit of Thomas Shipley for Identification," as "Complainant's Exhibit Lyndon-York Manufacturing Company Correspondence and Blueprints and Identifying Affidavit."

(The said group of blueprints last mentioned and the papers connected therewith so offered in evidence are marked "Complainant's Exhibit Lyndon-York Manufacturing Company Correspondence and Blueprints and Identifying Affidavit," together with the title of the court and cause and the date upon which the said Exhibit was offered in evidence.)

Mr. Blakeslee: We also offer in evidence the early sketches just produced by the witness with the attached affidavit of the witness as "Complainant's Exhibit Lyndon Construction Early Sketches and Identifying Affidavit."

(The said sketches and attached affidavit are marked "Complainant's Exhibit Lyndon Construction Early Sketches and Identifying Affidavit.")



Mar. 6, 1915. A. M.

Mr. Westall: Counsel for defendant objects to the offer of the papers which have been heretofore marked by the Examiner as "Complainant's Exhibit Lyndon Early Construction Sketches and Identifying Affidavit" and "Complainant's Exhibit Lyndon-York Manufacturing Company Correspondence and Blueprint and Identifying Affidavit," and to each and every of the purported affidavits, sketches, blueprints and other papers contained within the wrappers so marked, as not the best evidence, and upon the ground that no proper foundation has been offered for the introduction of secondary evidence. The purported exhibits or papers referred to are also objected to on the ground that they are not properly identified by the testimony of the witness, and that no proper foundation has been laid for their introduction. In addition to the objections before noted, the affidavits are objected to as being an attempt to insert into the record testimony by ex parte affidavits, thus depriving defendant of the right of cross-examination of the purported signers of the affidavits in question. It is particularly pointed out to counsel in making this objection that this testimony is taken under a stipulation, and that the introduction or attempted introduction of evidence in this form is not in accordance with the stipulation. It is also specifically objected that there has been no sufficient foundation laid for the introduction of purported copies of the correspondence of the American Trading Company contained within the wrapper marked "Complainant's Exhibit Lyndon-York Manufacturing Company Correspondence."

1848 31 add "together with the title of the court and cause and the date upon which said exhibit was offered"

sel's objection that, of course, we do not stand upon the affidavits, being part of these exhibits, as proof of the statements therein made under oath. These affidavits are put in evidence merely because they are attached to and have for some time been attached to the papers and other documents with which they are now connected. And as to the facts of these affidavits and the establishment of the other evidence contained in the several papers and documents of these two exhibits, we will furnish further proofs as the same may be deemed necessary before closing complainant's rebuttal case. Counsel is aware of the fact that these various persons whose testimony would be competent in these matters are scattered all over the country, and that it is impossible to proceed in taking their testimony with what might be the most logical sequence. However, we are only relying on the present witness in connection with those exhibits for his best testimony with respect to the same, and are not attempting to bridge by means of said deposition the gaps which might be properly filled in by the testimony of other witnesses. We shall proceed, of course, to inquire of the present witness with regard to these exhibits merely as to his own knowledge and rely upon such further witnesses as we shall deem it proper to call to go further into the establishment of the facts and evidence further pertinent to these exhibits.

Q. 98. Have you prepared the sketch requested of you yesterday in reproduction of the matter which you disclosed to Mr. Meyer with sketches during June or July, 1898, at the Westchester restaurant on Williams Street, New York City?

A. Yes. I have made a sketch, and so produce it.

Q. 99. I notice that you have placed upon this sketch various designating matter and wording. Will you now, please, generally describe what this sketch portrays, quoting the wording on the sketch in your answer and adding to the sketch any such further indicating symbols or wording as you may wish to weave into your description of it, and in connection with such description stating generally the mode of operation of the organization portrayed in the sketch?

A. This sketch is as nearly in accordance with the general character of the sketches which I am accustomed to make when explaining any mechanical or electrical device to another engineer, or otherwise technically-trained mind, to whom it is not necessary to trace all the details; and I believe it to be the same character of sketch as I made seventeen years ago in the Westchester restaurant to indicate to Mr. Meyer the ideas I had at that time. On the sketch which I made for Mr. Meyer there was no designating wording, as the explanation of the operation was entirely verbal. This sketch shows first a turbine case and a shaft projecting from the center thereof, which is meant to indicate the main drive-shaft of the turbine. From the turbine case there also projects a second shaft which is meant to indicate the gate shaft, which shaft is the operating shaft of the main turbine gates. These latter are not shown, it being assumed that any engineer knows that they must exist. Connected with the gate shaft is a bevel gear which meshes into two other bevel gears, these two latter being on the same shaft a short section only of which is shown. This short shaft is understood to be driven from some source of power, preferably the turbine itself.

The two bevel gears on this short shaft are loose on the shaft, and arranged to be clutched so that either one or the other would be constrained to rotate with the shaft, and, therefore, motion of the gate shaft would follow the direction of such motion, depending on which of the two bevel gears is constrained to rotate with the shaft on which they are mounted. The clutch which operates with either of these two bevel gears is moved to one side or the other, as conditions may require, by a lever, and this lever is operated by a pair of electro-magnets which are diagrammatically indicated as being mounted at the opposite ends of the bar connected with the end of the lever, opposite to the clutch-moving end of the lever. From this diagram it follows that the direction of motion of the gate shaft will be fixed by whichever of the magnets is energized. In this sketch is also roughly indicated and shown a shunt-wound dynamo, the armature of which is meant to be driven from the turbine shaft. The magnetic circuit of this dynamo, which is not here shown, would be designed to work well below magnetic saturation, so that the intensity of field magnetization would respond to changes in the magneto-motive force of the field winding, and almost as a direct or straight line function. Therefore, the voltage of this dynamo would vary much more rapidly than the speed changes which might cause the voltage changes, because not only would the speed of the armature rotating in the magnetic field be changed, and the voltage proportionately changed from this cause, but such change in the electro-motive force of the armature would also produce a corresponding change in the magnetization of the field itself, and it was anticipated that the change in

voltage would be very nearly proportional to the square of the change in speed. The armature of this generator is shown as connected to the terminals of a solenoid controlling magnet. Magnets of this type being seldom worked to the point of saturation, the pull changes very nearly in proportion with the square of the impressed electro-motive force. The core of this solenoid is shown connected with an oscillating lever at either end of which are indicated electrical contacts. The core of this solenoid has its pull opposed by a spring which is also connected to the oscillating lever. Under normal conditions the voltage of the generator would produce the pull on the solenoid which would just balance the opposing pull of the spring. An increase in the speed of the water wheel would produce an increase in the speed of the dynamo with a corresponding increase of voltage of the dynamo, and from this would result a greatly increased pull on the solenoid core, overcoming the pull of the spring and causing motion of the oscillating lever. This oscillating lever, when moved, will cause contacts to be closed at one end or the other, as the case may be. By following the circuits indicated it will be seen that when the oscillating lever moves in one direction and makes the contacts which result from motion in this direction, current will pass through one of the magnets which operates the clutch, which, in turn, causes operation of the gate shaft; while when the oscillating lever moves in the other direction, making the contacts which result from motion in this latter direction, the other magnet which causes operation of the clutch, which, in turn, causes movement of the gate shaft, will be energized. In addition to these features there is shown a short piece

of shaft which is intended to indicate that this short piece of shaft is a part of the governor mechanism, and which might be either one of the main shafts of the governor, or an auxiliary shaft. On this is mounted a pair of friction discs, one of the discs being attached to the piece of shaft and the other disc loose on it. These parts I have designated as "Friction Returning Device." When the oscillating lever, before referred to, moves so that the left hand end is depressed, it not only makes a contact to cause motion of the gate shaft, as before described, but it also makes a second contact which energizes a magnet, and the pull of this magnet through the intervention of the lever is meant to cause a pressure between the two discs, and, therefore, that disc which is loose on the shaft tends to rotate with the shaft because of the friction between it and the other mating disc, which latter is fastened to the shaft and constrained to rotate with it. Movement of this friction disc causes movement of the rod which is attached to a pin placed somewhere near the periphery of the disc. A movement of this rod produces a compression of one of the springs which is shown, which spring reacts against the oscillating lever, tending to push it back to normal position from which it was moved by the change in pull of the controlling solenoid. While this sketch does not indicate it, a similar contact for operating the friction returning device was meant to be understood as placed on the opposite end of the oscillating lever also, it being unnecessary in a description to a trained engineer to indicate more than one of several duplicate parts. These are the important features of the gate-moving device itself. In addition to these, the by-pass with the

butterfly valve was shown as indicated, and, if my memory has been correct in the reproduction of this sketch, there was no operating means shown in the original sketch in which I disclosed my invention to Mr. Meyer, for moving the by-pass valve. As far as I can remember, I indicated to him verbally that the by-pass valve would be arranged to move quickly, and, substantially, with the same rapidity as the main water-wheel gate, in the operation of governing; but that after the water-wheel gate had finally reached its new position of gate opening, the by-pass valve would then return slowly to its normal position. That is, the conception of the by-pass valve as operated by the water-wheel governor itself, and a slow return to normal position after governing was completed, were the fundamental elements of the conception I had on the day I first invented this device and disclosed it to Mr. Meyer. The actual mechanical means by which this could be accomplished, I believe did not take definite form for several days—possibly a week after that day.

Q. 100. What was the normal condition of the gate-shaft clutch mechanism to be?

A. The clutch mechanism would stand approximately in a mid-position between the two bevel gears, so that neither would be engaged.

Q. 101. You have referred in your description of this sketch to an oscillating lever bearing contacts for closing several electrical circuits. Will you please mark this part with the words "Oscillating lever."

A. (Witness does as requested.)

Q. 102. I notice you have applied in this sketch the character "X" to the turbine wheel shaft, and have also

applied the character "X" to the shaft of the armature of the generator utilized for energizing the electro-magnets for operating the clutch mechanism last referred to and for energizing other features of this system. What does the use of this character "X" imply?

A. It implies that they are mechanically connected together so that rotation of one is always attended by rotation of the other. In other words, the dynamo is driven from the main turbine shaft.

Q. 103. And that because of what general relation between the speed of the turbine shaft and the rate of rotation of the armature of this generator?

A. They would always preserve a fixed relation to each other, and any change in the speed of the turbine shaft would be attended by an exactly proportional change in the speed of the generator armature.

Q. 104. Then is it or is it not proper to refer to this generator and its armature as a speed-sensitive governing element?

A. That term, to my mind, correctly defines the combination.

Q. 105. I note that you have provided upon this sketch arrow lines connecting the gate-shaft clutch mechanism and features associated with the by-pass elements, such line being designated "Inverse Connection." What does this wording signify?

A. It signifies that the by-pass valve is meant to be moved from its normal or predetermined position by the governing mechanism.

Q. 106. In what relation as between these two elements?

A. In an inverse relation. That is, motion of the water-wheel gate in a direction to reduce or close the gate opening would be attended by a corresponding opening of the by-pass valve, both of these being operated from the one governing mechanism.

Q. 107. I notice that you have provided upon this sketch an element designated "Dashpot." What is the significance of this showing?

A. That is meant to indicate that the movement of the by-pass valve in returning to its normal position is retarded by some means in which a time element is necessary for the operation to take place. The dashpot is the simplest and best known of the time-element devices. Hence its inclusion in this sketch.

Q. 108. Are we to understand that what you have described or stated was the effect of the construction and operation of the several features and elements and groups of features as shown in this sketch now under consideration, constitutes in general substance the disclosure which you made to Mr. Meyer in June or July, 1898, at the Westchester restaurant in New York?

A. All of the portions which I have here shown, with the exception of the by-pass valve, formed my first disclosure to Mr. Meyer, and it was during the conversation about these portions of the proposed governor that the by-pass valve was added to the sketch, and sketched in as indicated. So that the final disclosure made to Mr. Meyer on the same day at this same time before mentioned, was in accordance with the parts and operations indicated on this sketch.

Q. 109. You have stated in your recent testimony that another contact device which you provided on the

oscillating lever, with a suitable circuit to cause action of the friction returning device upon movement of the oscillating lever in a direction the reverse of that causing operation of the friction returning device by means of the contact shown in the sketch on the other end of the lever. In order to get this operation of the friction returning device on the other side of the case, or upon such reverse movement of the oscillating lever, would it be necessary to do anything further than duplicate what is shown in this sketch with respect to the control of the friction returning device.

Mr. Westall: Objected to as leading.

A. No; there would not be. That is the reason why this additional set of contacts was omitted from the original sketch.

Q. 110. By Mr. Blakeslee: Then am I to understand that the friction returning device was to be utilized in connection with governing action upon both increase and decrease of speed of the water-wheel?

Mr. Westall: Objected to as leading and suggestive.

A. It was intended to be operated in either or both directions.

Q. 111. By Mr. Blakeslee: In other words, was it intended that this should operate as desired in connection with either speed correction?

Mr. Westall: The same objection.

A. Yes.

Q. 112. By Mr. Blakeslee: In the matter of this sketch and the matter of your detailed disclosure, including that of the sketch, to Mr. Meyer, at the time stated in 1898, did any parts, features or elements of construction or inter-relation, require to an engineer or

one skilled in the art any further detailed description in order to fully inform such person of the working system and construction?

A. I should say to one skilled in the art that this sketch or its equivalent would be complete information as to the functions to be fulfilled and the methods whereby they would be fulfilled. The sketch does not show nor does it purport to show the exact mechanical details which would enter into the construction of the machine, nor would the indication of these details help to understand the device, it being well known that with a multitude of mechanical movements and devices the same function can be obtained in numerous ways, and the question of actual machine design after an invention is made is a matter of personal judgment.

Q. 113. And were each of the parties, Meyer, Reid, Edward Lyndon, Merrill and the others whom you have mentioned as having been recipients of the general disclosure of your invention of the patent in suit, such persons as were qualified to receive such disclosure and understand the possible embodiment of the same into working construction?

A. Every one of the parties mentioned, to whom I disclosed this invention, was a technically educated man and one whose profession or business was engineering or lines allied with it, with the exception of my brother, who, at the time, had not yet left college, but was taking an engineering course at the University of Georgia.

Q. 114. How does the matter of the sketch still before us compare, generally, with other sketches you made disclosing the invention of the patent in suit to Mr. Reid, your brother and such other persons as you

have testified you did disclose the invention to, in the year 1898?

A. Just how far it would parallel such sketches, it would be impossible at this date to say. I believe that sketch to represent very closely the sketches which I did make at the times you have mentioned in your question, because I revealed to each of these parties all of the important features of the invention, described the operation of the proposed machine, and made sketches to illustrate the various operations of the machine. The sketches of any engineer are almost as characteristic as his handwriting, and it is possible among engineers who know each other intimately and know each other's work to determine, what engineer made a certain sketch merely by the personal characteristics, which are like the personal characteristics of his handwriting. I therefore believe that this rough sketch which I have made is very similar to all the other rough sketches which I made for the purpose of illustrating the device and functions of this invention.

Q. 115. From your knowledge and experience in connection with the discussion between engineers and technically educated persons relative to devices of mechanisms and apparatus of various kinds, is the subject of this sketch one which could well be disclosed by one technically educated person to another, and received by him intelligently even without the aid of pictorial representation?

A. Yes; it is perfectly practicable to describe to an engineer the whole of this device so that he will understand it, without any pictorial representation at all. It however, would require a much longer time, and be much

more difficult to do, than to make a sketch for the purpose of illustration.

Q. 116. Are there any details shown in this sketch or entering into your said disclosure to Mr. Meyer and others, pertinent to the invention of the patent in suit, or any details of construction disclosed in the patent in suit, "Complainant's Exhibit A," which, considered from the standpoint of work-shop practice, were not well known in the art and other allied arts at the time you conceived of and disclosed first to others the invention of the patent in suit?

A. I know of no element that entered into the make-up of this invention that required the production of a new mechanical device or electrical device to make up an operative machine.

Mr. Blakeslee: We offer in evidence the sketch lately under discussion with the witness, and ask that the same be marked "Complainant's Exhibit Lyndon Reproduction Sketch of his Disclosure Sketches of June and July, 1898."

Mr. Westall: Counsel for defendant objects to the introduction of the sketch referred to on the ground that it is not the best evidence, and upon the further ground that there has been no proper foundation laid for the introduction of secondary evidence, and on the ground that it has not been sufficiently shown to be an accurate representation of any sketches alleged to have been made by the witness prior to the granting of the patent in suit.

Mr. Blakeslee: Without argument, we merely point out in this connection that the record shows that the witness has not in his possession or under his control the

original sketches attempted in this sketch to be reproduced, and that the witness has testified that his early records of this invention in the year 1898 have largely been disposed of long ago.

(The said sketch so offered in evidence is marked "Complainant's Exhibit Lyndon Reproduction Sketch of his Disclosure Sketches of June and July, 1898," together with the title of the court and cause and the date upon which the said sketch was offered in evidence.)

Q. 117. By Mr. Blakeslee: Returning again to the question of your disclosures to others pertinent to the invention of the patent in suit, have you anything further to say in this connection, particularly with respect to one Frank A. Wunder, if you know him?

A. Wunder at that time, and, as I believe I have previously testified, was manager of the New York office which was also the Export office of the Ft. Wayne Electric Company. I met Mr. Wunder very shortly after my return to America in May, and it was prior to my departure from New York for Athens, Georgia, during the summer of that year. I disclosed this invention to Mr. Wunder, but I cannot state at what date. Mr. Wunder, although manager of the Ft. Wayne Electric Company's office in New York, is not a technically educated man, and, while he at that time had a considerable amount of general knowledge of machinery and electricity, he was not, I believe, sufficiently well equipped to receive fully the disclosure which I made to him. I did not at that time know Mr. Wunder's limitations in this direction, and it was not until sometime later that I concluded that he had only partly apprehended the explanation I had given him of my invention.

Q. 118. Referring now to "Complainant's Exhibit Lyndon Early Construction Sketches and Identifying Affidavit," will you please state when, where and under what circumstances you made these sketches, and point out by corresponding characters, numbers or letters to be applied to the sheets of these sketches the general elements or groups of elements therein disclosed, and state briefly the intended operation of the parts and, in the first place, please mark these sheets by consecutive Roman numerals from the top one to the bottom one, and use these numerals in referring to the sheets.

A. These sketches were made while I was Chief Engineer of the American Trading Company with office at 100 William Street, New York, and to the best of my memory were made at that office. They were made for the purpose of guiding the designers in the draughting room of the York Manufacturing Company, so that there could be prepared shop drawings from which the actual commercial machines could be produced. These sketches have been designated with Roman numerals from I to V, inclusive.

Sketch III is a suggested general assembly of the machine itself, the controller not here being shown. The main drive pulley intended to be driven by the water-wheel shaft is on the left of the machine. The journals of the various shafts are indicated, as is customary, by rectangles with diagonal lines running across them. there is indicated a journal just to the right of the main drive pulley. Adjacent to this journal and on the same shaft as the main drive pulley is a grooved sheave pulley marked "Dynamo Driver," from which sheave pulley it was intended that the controlling dynamo would

be driven, a round-belt multiple drive being adopted so that there could not possibly be any belt slippage between the controlling dynamo and the main shaft. To the right and adjacent to the dynamo driver is shown a second journal and adjacent to this journal on the same shaft a collar "a". Next to this collar is the hub of a bevel gear mounted on the shaft, and loose on it, so that the shaft may rotate freely without turning the bevel gear. At the extreme right hand end of the shaft is a journal, and to the left adjacent to this journal another collar, also, marked "a", and against this collar and adjacent to it is the hub of a second bevel gear which I now mark "Bevel Gear." The two bevel gears on this shaft are separated a distance apart such that they both are enabled to mesh with a third bevel gear on a second shaft at right angles to the first shaft, the two first-named bevel gears meshing on the opposite sides of a diameter of the third-named bevel gear, which I now mark, "Large Bevel Gear." The bevel gear on the right hand end of the shaft similarly with the first-named bevel gear is loose on the shaft, and the shaft may rotate freely without turning it. Between these two bevel gears is a sleeve which is keyed to the shaft and constrained to turn with it, the ends of this sleeve being tapered to fit into the mating tapered recesses in the hubs of the two first-named bevel gears. This sleeve is free to slide longitudinally on the shaft, and in the middle of it a groove is formed which runs girthwise around the sleeve, and in this groove fit small rollers which latter are fastened to a jaw which embraces the sleeve so that the sleeve is free to turn, but any motion of the jaw in a direction parallel with the axis of the shaft will

cause the sleeve to move also axially along the shaft. The jaw carrying the rollers forms one end of a lever pivoted at some distance away from the jaws, and the lever is extended past this pivoted point, and on the end thereof opposite from the end on which the jaw is fastened, a laminated iron armature is attached, which, in its normal position, is half-way between the poles of two electro-magnets, one being set on either side of the armature. It is obvious from this drawing that if one of the magnets is energized the armature will be attracted to it, the lever caused to turn about the pivot, thereby sliding the before-mentioned sleeve axially along the shaft, and causing the tapered end of the sleeve to engage frictionally with the tapered recess of the hub of the bevel gear towards which the sleeve is moved, thereby causing that one of the bevel gears to rotate with the sleeve and with the shaft. Rotation of this bevel gear produces rotation of the third or large bevel gear in a direction which is fixed by the direction of the rotation of the main drive-shaft. I now mark the electro-magnets just referred to "Electro-Magnets." It is also obvious that if instead of the first-named electro-magnet the other one be energized, the lever will move in a direction opposite to that in which it first moved, the sleeve will slide along the shaft in a direction opposite to that in which it was first caused to slide, and thereby frictionally engage the other small bevel gear, and in this manner cause the large bevel gear with which it meshes to rotate in a direction opposite to that in which it is made to rotate when the first-named bevel gear is engaged. In this manner the second shaft on which the large bevel gear is fastened is caused to rotate in one direction or

the other, according to which one of the electro-magnets is energized. Following now the second shaft from the large bevel gear upward, the following devices are mounted on it: First, a journal; next, and adjacent to that, a collar; next to the collar a pair of friction discs, which I now mark "Friction Discs." After these comes a worm, and after the worm a journal. This worm meshes with a worm-wheel which latter is mounted on a third shaft at right angles to the second shaft and parallel with the first-named shaft. I now mark these shafts, "First Shaft," "Second Shaft," and "Third Shaft," respectively. On this third shaft, passing from left to right and in order, are, first, the worm-wheel before mentioned; next, a journal, and next a disc, over a portion of which is a lever that is placed above and at right angles to the third shaft next, a friction clutch which is attached to and forms a portion of the disc just mentioned, the clutch comprising two portions, one being loose on the shaft and the other keyed to the shaft, but capable of being moved along the shaft in the axial direction; next comes a journal, and, finally, one-half of a flange coupling, which flange coupling is meant to mate with and be bolted to a similar half of a flange coupling on the gate-shaft, so that the rotation of the third shaft will also cause rotation of the gate-shaft. And since the third shaft is driven by the second shaft through the worm and worm-wheel gearing, and, furthermore, the second shaft is capable of being rotated in either direction, depending on which one of the electro-magnets is energized, it follows that the gate-shaft is moved whenever an electro-magnet is energized, its direction of movement depending on which of the magnets is ener-

gized, and the duration of movement depends on the period of time that electric current is supplied to one of the electro-magnets. It has been before mentioned that the armature which cooperates with these magnets is of laminated iron. The magnetic circuit of the magnets is also of laminated iron, and the laminations are clearly indicated in the sketch. The object of using a laminated magnetic circuit is to insure the instantaneous release of the armature by whichever magnet it may be attracted to as soon as current through the winding around the magnetic circuit is interrupted. It will be noted that on either side of the lever which carries the armature, at one of its ends is a spring. When the lever is moved in either direction the spring on that side of the lever towards which motion takes place, is compressed, so that the magnetic pull must not only move the sleeve to engage one of the bevel gears, but must also overcome the pressure set up by the compression of the spring. When the current through the magnetic winding is interrupted, and the magnetic pull ceases to exist, the spring pressure will cause the lever to move back to its middle or normal position, thereby releasing the bevel gear from frictional contact with the rotating sleeve.

Referring now to the friction discs on the second shaft, one of these discs is keyed to the shaft and constrained to rotate with it, but is free to move along the shaft. There is an arrangement of a groove in the hub of this disc, rollers running in the groove, a lever with a jaw to the ends of which jaw the rollers are fastened, a pivot about which the lever can partially rotate, an armature on the end of the lever opposite to that on

which the jaw is placed, and an electro-magnet which, when energized, will attract the armature and cause motion of the lever, and, therefore, of the disc, all being in a measure similar to the previously described lever, jaw and magnetic arrangement whereby the sleeve on the first shaft is moved, providing a means of pressing the disc which rotates with the shaft against a second disc which bears against a collar on the second shaft. This second disc is not fastened to the shaft, and the shaft may rotate freely without causing the disc to move with it. When, however, the electro-magnet which I now mark "Friction Returning-Device Magnet" is energized, and the disc with which the lever cooperates is pressed against the second disc, the latter is constrained to rotate with the shaft, providing the force which opposes its rotation be not greater than the force which causes it to rotate, which latter force is proportional to the pressure between the two discs and the coefficient of friction between them. On the second disc there is indicated a crank pin with the end of a lever or rod attached. The direction of this lever in this drawing is perpendicular to the plane of the paper, so that only the cross-section of a round rod attached to a crank pin is indicated at the point I now mark "b". Considering this rod as perpendicular to the plane of the paper, it is obvious that the rod will be moved upward or downward, depending on the direction of the motion of the second shaft, provided the friction returning-device magnet is energized. This rod is the rod which is indicated in Sketch V, which latter sketch shows fully the function of this rod, and which I will discuss later more fully

when describing the Sketch V, and which I now letter similarly "b".

Passing now to the disc clutch and lever arrangement shown on the third shaft, there is a sheave wheel which I now mark "e" and which in the sketch lies directly under the lever, which lever I now mark "d". The groove in this sheave wheel does not show, because of the position of the lever "d" over it. The sheave wheel is fastened to and is a part of the clutch, which I now mark "e". This portion of the clutch, together with the sheave wheel to which it is attached, is free, so that the third shaft can rotate without causing any rotation of these parts. The sheave wheel is meant to carry a wire rope connection to the lever on the shaft of the butterfly valve in the by-pass pipe. The disc which I now mark "f" is provided with two projecting pins which are placed at opposite ends of a horizontal diameter of this said disc "f". The lever "d" which is pivoted at the point which I now mark "g" carries at its opposite end a weight, which I now mark "h"; this weight being arranged to slide along the length of the lever and thereby vary its moment about the pivotal point "g". Normally, this lever rests upon the two pins in the disc "f" and near its periphery. Obviously rotation of the disc "f" in either direction will raise the lever, causing it to turn around its pivotal point "g", lifting the weight "h". It is also obvious that if the lever be raised by the rotation of the disc "f", and the force causing this disc to rotate be removed and the disc be free to turn that the moment of the force produced by the weight "h" on lever "d" pushing against that one of the pins in the face of the disc "f" which has caused the lever to be

raised will rotate the disc "f" back to its normal position, which normal position is reached when the lever rests on both the pins before mentioned. The friction clutch made up with the tapered recessed portion "e" attached to the disc "f" and the mating tapered portion which I now mark "j", together with a magnetically operated lever and jaw arrangement to slide the part "j" into and make frictional contact with the part "e" similar to the other magnetically operated friction devices which I have before described. Its method of operation is clear from this sketch. The electro-magnet which I now mark "By-Pass Operating Magnet" when energized, will cause the friction clutch "e-j" to engage, and the disc "f" together with the sheave wheel "c" is then caused to rotate with the third shaft. As soon as the current supplied to the winding of the by-pass operating magnet is interrupted, the clutch "e-j" releases and the lever "d" which has previously been raised by the rotation of disc "f" is caused to descend by the action of the weight "h", thereby returning the disc "f" to its normal position, and the butterfly valve in the by-pass being operated by the sheave "c", will also be returned to its normal position by the descent of the weight "h", and the before-described action of the lever which returns the disc "f" to its normal position. The butterfly valve being balanced and frictionless, will not retard or prevent this action from taking place.

Q. 119. How, and by what means, was the by-pass valve, in accordance with this sketch, to operate with relation to the main water gate?

A. In an inverse direction. For closure of the main water gate there would be opening of the by-pass gate.

Q. 120. And, generally, what caused that inverse relation? What established this inverse relation?

Mr. Westall: Counsel for defendant objects to the motions of counsel for complainant to the witness at different times of the examination, and the various signs which are made and which it is plain to read is an endeavor to coach the witness and put words into his mouth. I do not understand that it is proper in proceedings of this kind, and while the witness is on the stand, to carry on conversations not entered of record, and I believe counsel for complainant at a prior time has made an objection of that kind under exactly the same circumstances.

Mr. Blakeslee: We do not agree to this statement at all, and if counsel has any objection to make to any of the procedure in connection with the examination of the witness, we expect him to make it and make it specific. Counsel for complainant admits that he waved his finger in the air to signify that he wanted the witness to describe something doing, and is willing to be criticised in that respect. Captiousness requires it. We give notice to counsel for the defendant that we expect him to specifically object if he has objections to make at the time such objectionable procedure occurs. We deny that in any way we have coached the witness, although at times we have suggested off of the record that he provide reference letters, and designating characters and words, as he proceeded, in order to expedite the deposition. If there is any objection to this at any time, we expect counsel for defendant to speak out at the time.

(The question is read by the Examiner.)

A. The mechanical connection of the parts.

Q. 121. Namely, the train of parts you have described? Is that correct?

A. Yes.

Q. 122. How was the part marked "Main Drive" in this Sketch III, intended to be actuated, or from what source or prime mover?

A. From the water wheel itself, that this device is intended to govern the speed of.

Q. 123. What was to be the connection between the parts of this Sketch III and the water-wheel gates?

A. As I have previously testified, the connection between the machine as disclosed in Sketch III and the water-wheel gate was to be made by means of the flange coupling of which one-half is shown on the third shaft, and which I now mark "Flange Coupling."

Q. 124. And as the large bevel gear in this sketch was oppositely turned by the respective co-acting bevel gears, what was the effect upon the water-wheel gate through this part just marked "Flange Coupling?"

A. It caused the water-wheel gate to be opened or closed, according to the direction of motion of the large bevel gear, which, in turn, depended for its direction and motion on which of the two small bevel gears might be clutched to rotate with the first shaft.

Q. 125. And what was the effect of the parts, including the friction returning device magnet, upon the rotation of the second shaft?

A. The friction returning magnet device had in itself no effect on the rotation of the second shaft. It indirectly affected the direction of rotation of the second shaft acting through an electrical controller which I

have not described in connection with the description of these sketches numbered from I to V.

Q. 126. To what end did it so indirectly act upon the second shaft?

A. It acted to cause the electric circuit through whichever of the main operating electro-magnets might be energized to be opened before the controller mechanism normally opened them, and, therefore, to cause cessation of rotation of the second shaft before this cessation would normally take place.

Q. 127. And what was the object of that anticipatory cessation of rotation of the second shaft?

A. To prevent the governor from moving the water-wheel gates to a point of opening that would be greater or less than the opening required for the change in load that might come on the water wheel.

Q. 128. Such change in load causing what, in respect to the water-wheel operation?

A. Causing a change of speed.

Mar. 6, 1915. P. M.

Q. 129. Considering further the sketches of "Complainant's Exhibit Lyndon Early Construction Sketches and Identifying Affidavit," have you any further statement to make as to the construction, inter-relation and operation of the features shown in and by any of these sketches?

A. Yes.

Q. 130. Please proceed to do so in the same general manner as you have discussed Sketch III of these sketches.

A. Sketch I is a shop sketch for the operating electro-magnets the dimensions, number of turns and details

all being shown, and they are sufficiently clear and complete for this sketch to serve as a shop drawing and from it to produce the magnet complete.

Sketch II is a similar shop sketch of the laminated armature which is intended to cooperate with the magnet. This armature is the detailed armature drawing shown in Sketch III between the two electro-magnets on the end of the lever which operates the sleeve on the first shaft.

Sketch IV, also marked Sketch 42B, is as indicated by the legend on this sketch, a detail of a weight and lifting collar, through a hole in which weight a rope is passed. This represents a modification of the method of returning the by-pass valve to its normal position, and is meant as a substitute for the weighted lever "d" shown in Sketch III. As indicated in Sketch IV, the rope may move in one direction, passing freely through the weight, without moving it; but, if moved in the other direction, the lifting collar will catch against the under side of the weight so that the weight will be then lifted with the rope. The rope is meant to be actuated from the sheave wheel "c" of Sketch III when clutch "e-j" shown in Sketch III is brought into operation and the rope to the by-pass valve moved, causing movement of the by-pass valve, and, at the same time, the weight surrounding the rope shown in Sketch IV is lifted, and subsequently the clutch "e-j" is released the weight descends, bringing back with it the rope by reason of the fact that the weight rests on the lifting collar which is attached to the rope. This sketch was made sometime subsequent to the Sketch III, as evidenced by this proposed modification of the original device shown in the Sketch III to accom-

plish this same object. A number of variants of the originally proposed mechanical arrangement suggested themselves, and in some of the final shop drawings made by the York Manufacturing Company, which have been put in evidence, other mechanical arrangements for accomplishing this same purpose have been adopted. In all of these, however, the original idea of a lifted weight returning slowly to its normal position in order to bring the by-pass valve also slowly to its normal position has been preserved. In Sketch III the means used to adjust the time of return to normal position of the by-pass valve is shown as a dashpot, the piston of the dashpot being connected to the lever "d" as indicated in the sketch, and which I now mark "Dashpot."

Sketch V shows the contact-making and controlling mechanism. A Solenoid core which is marked on the sketch "Soft Iron" is surrounded by an insulated-wire winding or solenoid, as indicated. The core is suspended and its weight practically balanced by the upper spring which I now mark "Spring No. 1." This spring in turn was to be suspended to a screw-eye supported by a bracket through which the threaded portion of the screw-eye would pass, and above the bracket, as is indicated, are two nuts, one which served to adjust the position of the suspending spring No. 1, and, therefore, the location of the soft iron solenoid core, the other nut being a jam nut to prevent the adjustment from being disturbed in operation. Connected with the solenoid core is shown a jointed rod which is screwed into the center of the core and extends vertically downward from it. A short distance below the core is a lever, the normal position of which is horizontal. It is pivoted about its

middle point as shown, and which point I now mark "Pivot No. 1." A connection is made between this downwardly extending or operating rod and the horizontal lever, so that when the solenoid core is caused to move upward or downward the lever will oscillate about its pivotal point, lifting one side and depressing the other, depending on the direction of motion of the solenoid core. At either end of the horizontal lever is fastened a contact point, which point dips into an mercury contact cup. As indicated, the length that these points project beyond the lower edge of the lever, is adjustable by means of the nuts which screw onto the threads formed on the upper end of the contact points. These contact points are meant to operate the main controlling magnets and the short lengths of wire connected with them are marked on the sketch "To Controlling Magnet." From the drawing it is clear that motion of the soft iron core in the solenoid will cause electrical connection to be made to one or the other of the controlling magnets before referred to and shown in Sketch III, the magnet energized depending on the direction of motion of the soft iron core. Passing through the lever, and on the opposite side of the pivot from that side on which connection is made with the operating rod, and which lever I now mark "Lever No. 1," is a rod which is the same as the rod "b" which has before been mentioned in my description of the part shown in Sketch III, and which I have also marked "b" on this Sketch V. Surrounding this rod are two springs, one is placed above the lever No. 1, and the other below it. It is obvious that if rod "b" be pushed upward the lower spring will be compressed and tend to force lever No. 1 to turn about pivot

No. 1 in a clockwise direction. If the solenoid core had previously been pulled upward, the lever rotated with a counter-clockwise direction, and the left hand contact to one of the controller magnets closed, and subsequently the rod "b" were moved upward so that the lower spring would be compressed, the force set up by the compression of this spring would tend to neutralize and overcome the force exerted by the magnetic pull on the solenoid core, which force had previously overcome the lower spring at the bottom of the actuating rod, and which spring I now mark "Counterbalance Spring," thereby lifting the actuating rod and causing the motion of lever No. 1 to close the left hand contact. The parts are all intended to be in equilibrium and substantially in the positions shown in the sketch when the speed of the controlling dynamo, the driver of which is shown in Exhibit III and which I have elsewhere previously described, is at its normal value. An increase in the speed is followed by an increase in the voltage, and, therefore, the pull of the solenoid core shown in Sketch V is increased; and if this increase in pull be sufficient, the pull of the counter-balance spring and the friction of the moving parts will be overcome, motion of the lever will ensue and the left hand contact be closed. The closing of this contact will energize one of the actuating magnets and the arrangement of connections is intended to be such that the magnet thus energized is the one which causes the motion of the gate shaft to take place in such a direction as will tend to close the gates, and thereby reduce the speed of the water wheel. As the speed of the water wheel begins to diminish, the pull of the solenoid begins to diminish also; and, in the course of time

when the speed of the water wheel returns to normal, the action of the counter-balance spring would bring the lever and solenoid core back to their normal position. If, however, there were no auxiliary device, the momentum of the moving parts of the water wheel and water-wheel gate would cause the governor to continue acting, and thereby move the gates a greater distance than the change in load demands. It therefore is necessary, in order to prevent such over-running, to bring into play an auxiliary force which tends to move the lever back to its normal position and oppose the pull, either of the solenoid core or the counter-balance spring, whichever may predominate, so that the lever may be returned to its normal position before the water wheel has returned fully to its normal speed. The springs shown above and below lever No. 1, moved by the rod "b", are intended to accomplish this result. I have previously explained in a description of the friction discs on the second shaft in Sketch III, how it causes a movement either upward or downward of the rod "b", and with this explanation, taken together with the sketch, it is obvious that motion of the water-wheel gate shaft is attended by motion of the rod "b" and therefore by a ^{friction} ~~comparison~~ of one or the other of the two springs on rod "b", and which press against the lever No. 1. There is also indicated, merely diagrammatically, however, two returning springs on rod "b" which are meant to be separate from the two springs that act on lever No. 1. The function of these two returning springs is simply to return rod "b" and with it the friction disc to which it is attached, to its normal position after the pressure between the friction discs is relieved, and in the usual and well-

known manner of using two opposing balance springs for this purpose. In addition to the two main contacts shown on lever No. 1, there is another contact shown on another lever, which I now mark "Lever No. 2." The mechanism indicated and its method of operation would be obvious from the sketch. Any motion of the solenoid core, whether upward or downward, would cause the right hand end of the lever No. 1 to descend, thereby closing the electrical contact and establishing an electrical connection through this contact to the auxiliary magnets, that is, the magnet operating the friction returning device and the magnet operating the by-pass friction clutch, so that any motion of the solenoid in either direction will cause both the friction discs, operating the returning device, and the friction clutch, operating the by-pass valve, to become engaged. An auxiliary contact is also provided, as shown detached in the lower left hand corner of the sketch. The iron point which dips into the mercury cup is fastened through a lever, which I now mark "Lever No. 3." This lever normally is in a horizontal position, and in this position the contact point dips into the mercury and contact is thereby permanently made except when interrupted. A vertical rod adapted to rise upward to engage on the under side of the lever, thus lifting it together with the contact point so as to break the connection, is shown and marked in the sketch "To Clutch Release on Second Shaft." The object of this contact and this lever is to prevent excessive wear of the friction surfaces on shaft No. 2, which operate the returning device. In the mechanism as conceived by me, I desired to make the strength of the magnets operating the main friction clutches which cause

engagement of the gear wheels on the first shaft, as small as possible, and this required that the shaft have as high a speed as mechanically practicable and suitable. In order to reduce this speed sufficiently to operate the gate shaft, a reduction gearing was necessary, and I have shown in Sketch III and in other drawings the use of the worm and worm wheel for this purpose. From Sketch III it is obvious that there will be a great many revolutions of shaft No. 2 to produce one revolution of gate shaft No. 3. The friction discs which operate the returning device are placed on shaft No. 2, so that the returning device will come into play almost instantly when governor movement begins. Obviously the motion of the friction disc to which the vertical rod "b" is attached, is limited to something less than 85 degrees from normal in either direction. The returning springs on rod "b" are meant to be of such strength and the separation between the coils of the springs of such width that when the proper distance of rotation of the friction disc to which the rod is attached has been reached, the rod can move no further and rotation of the friction disc is arrested. This point, as stated, will be reached after shaft No. 2 has turned through between 80 and 85 degrees. Obviously shaft No. 2 would make at least a complete revolution, if not a large number of complete revolutions, for each operation of governing. In this case the friction between the two discs of the returning device would be rubbed together with the pressure between them set up by the magnet, and this in the course of time would cause considerable wear on these discs. With the arrangement as indicated in Sketch V. however, this wear is almost entirely eliminated by reason of the

fact that the rod marked "To Clutch Release on Second Shaft" is lifted by the movement of the returning device of the disc, and when this disc reaches its maximum degree of rotation as previously determined, and for which it would be adjusted, any further movement would cause the rod which I now mark "Release Rod" to move upward, lifting lever No. 3 and opening the contact at the end of that lever. This contact is interposed in the electrical circuit from the contact on lever No. 2 to the magnet of the friction returning device. From these considerations it follows that when the maximum point of rotation is reached by the friction disc to which rod "b" is attached, any further movement opens the circuit to the friction-disc-actuating magnet and releases the pressure on it, thereby leaving the disc to which rod "b" is attached free to start to return to its neutral position. When it begins to return, release rod "b" moves downward, contact is again made, and pressure re-applied. It was expected that this cycle of operations would proceed with comparative frequency; and, the circuit being made and broken within very short intervals, taken with the time element of the magnet due to self-induction, would result in a partial reduction of the magnetic pull, thus reducing the grinding action between the two surfaces, or, at all events, if the time element of the magnet were not sufficiently great for this, the disc to which rod "b" is attached would be held in its maximum position by a series of impulses rather than one continual rotating force. This additional contact was in no wise necessary to the operation of the device, and, as stated, was merely a suggested arrangement for reducing possible wear between the friction surfaces.

Q. 131. By Mr. Blakeslee: To break in at this point.

A. I have finished.

Q. 132. Oh. Please state where, if at any place, this release rod and its associated contact device just described by you, finds its disclosure in "Complainant's Exhibit A," a copy of the patent in suit?

A. The rod in Fig. 1 of the patent in suit is marked "25" and "25a", the portion marked "25" being that portion which passes through the lever in the controller, and the portion marked "25a" being a jointed or connecting rod portion which is attached to the friction disc, and that in the patent drawing is marked "22."

Q. 133. Is there any counterpart of the rod "b" of Sketch V shown in the drawing of the patent in suit?

A. Yes.

Q. 134. Where is that shown?

A. It is that portion marked "25" and bearing on it the springs marked "27" and "28" which bear against opposite sides of the lever, and the returning springs which are merely roughly indicated in Sketch V are shown in the patent drawing and are numbered "29."

Q. 135. Is there any mercury contact device such as that shown in connection with the release rod in Sketch V shown in the drawing of the patent in suit? And, if so, where?

A. If it is, I fail to find it.

Q. 136. Then, if there any part in the patent in suit corresponding to the friction returning device magnet of Sketch III, and, if so, what?

A. Yes. It is the magnet marked "32" in the patent drawing cooperating with the armature "31."

Q. 137. Then, as I understand it, this auxiliary de-

vice, including the mercury contact applied to lever No. 3, associated with the release rod in Sketch V, was a further feature which you had in mind and one which was not incorporated in the disclosures of the patent in suit? Is that correct?

A. Yes. I did not consider that of any material importance, so far as a disclosure of the patent was concerned. And, in reality, in reducing this invention to practice, that release rod arrangement was not used.

Q. 138. Please state a little more fully what the further showing in Sketch V signifies, namely, those parts directly associated with lever No. 2.

A. Do I understand by that that you desire to have me describe more fully the mechanical movement of these parts, or the design of the contacts themselves?

Q. 139. What I wish to know, is, what the function of contact device associated with lever No. 2 was, and how it performed and for what purpose.

A. Motion of the solenoid core in either direction would lower the right hand end of lever No. 2, causing the metal stud on the end to dip into the mercury cup below, and thereby close the electrical circuit through both of the auxiliary magnets. That is, the magnet "32" of the patent drawing which operates the friction returning device and magnet No. 64 of the patent drawing which operates the friction clutch moving the by-pass valve. The operation of this controller is best explained by assuming a specific direction of motion. Let it be assumed that the speed of the water wheel is increased, due to a diminished load on it. The voltage of the controller generator would increase, thereby increasing the pull of the solenoid on the soft iron core, lifting the

right hand side of lever No. 1, closing the contact on the left hand side of lever No. 1, thereby starting the bevel gearing on shaft No. 1, which bevel gear will cause rotation of shafts Nos. 2 and 3, in a direction to close the gates. At the same time that lever No. 1 is moved, lever No. 2 will also be moved, and the magnets 32 and 64 of the patent drawing energized by reason of the contact at lever No. 2 being closed. Rod "b" almost instantly rises upward and compresses the spring on the under side of the lever No. 1, thereby applying a force which tends to restore this lever to its normal position as has before been described. Also, the by-pass valve is moved through the action of clutch 57, 58 of the patent drawing and the sheave wheel 54 connected to this clutch, the direction of motion being such that the by-pass valve is opened. The speed of the turbine will begin to diminish, and, due to the diminution in pull on the solenoid, together with the action of the counter-balance spring of Sketch V, pressure of the spring on rod "b", lever No. 1 is returned to its normal position, together with lever No. 2, which is also returned to its normal position, thereby opening all the contacts and releasing all the clutches so that the various described parts of the magnets are returned to their normal positions. It is probable, however, that governing will not have been completed, because the pull on the solenoid, even after this process just mentioned, will still be greater than the opposing pull of the counter-balance spring, due to the fact that all these contacts have been opened with the assistance of the auxiliary force, which proceeds from the compression of the lower spring on rod "b", and which force has been removed in advance of the com-

plete reduction of the magnetic pull to its normal value. Therefore, this same cycle might again follow, its time of operation being very short compared with the first or initial cycle.

Q. 140. Assuming in the operation of this mechanism which we are now discussing, that the pull upon the core of the solenoid due to the radical disturbance of the speed of the water wheel operating the generator energizing the solenoid, is sufficient to oppose any immediate core movement through movement of lever No. 1 under the attempted action of the returning device, and that governing action persists, what will be the action of the co-engaging surfaces of the friction discs of the returning device?

A. The friction discs will continue to rub together, one being constrained to move with the shaft and at the same angular velocity, while the other having reached its position of maximum travel will be arrested in its rotation, and there will be a continuous rubbing action as long as governing persists.

Q. 141. And in that way is it correct to say that this rubbing action will be accompanied by a slippage between these discs which will accommodate such persisting governing action until this slippage terminates, due to a response of lever No. 1 to the frictional efficiency of the said friction disc?

Mr. Westall: Objected to as leading and suggestive.

A. The question is not clear to me, as it stands.

Q. 142. By Mr. Blakeslee: I will withdraw the question and put the following: Now, consequent upon the slippage due to the rubbing action of the friction discs of the returning device, when will this returning

device become effective to actuate lever No. 1 and move the core of the solenoid?

A. The action to return lever No. 1 to its normal position would begin to manifest itself after the shaft No. 2 had rotated between 15 and 20 degrees. After about 80 to 85 degrees of shaft rotation, the pressure set up by the springs of the returning device against lever No. 1 to cause it to return to its normal position, will have reached its maximum and will remain there until the lever itself is returned to its normal position. Therefore, this returning force comes into play almost instantaneously, or within an inappreciably short time after movement of the shaft No. 2 begins, as compared with the length of time required to move the water-wheel gates. My memory is that the speed of shaft No. 2 was expected to be 300 revolutions per minute or 5 revolutions per second. Therefore, to make concrete a reply to your question, the length of time which would be required for the rod "b" of Sketch III and Sketch V, and corresponding to the rod "25" and "25a" in the patent drawing, will have gone from its normal position to the position where the maximum returning force is applied to the lever "b" within approximately 1-20 of a second.

Q. 143. Please suppose this condition: An extensive disturbance of the speed of the water wheel occurs, and an intense energization of the controlling solenoid takes place, which moves the core of the solenoid and then holds it effectively against returning movement under actuation of the rod "b" and friction clutches of the returning device, so that the slippage we have referred to occurs between the friction surfaces

of the returning device, and the governing action continues undisturbed or unaltered by the returning device and shaft No. 2 continues to rotate. When, now, under these conditions, will the returning device act through the rod "b" to move lever No. 1 and thereby move the core of the solenoid in a direction toward its normal position?

A. The maximum returning pressure, as I have before stated, will be reached within approximately 1-20 of a second. After that, slippage between the two discs will continue as long as the second shaft continues to rotate. During this period of continuance of rotation of the second shaft the torque produced by the slippage between the two discs will maintain rod "b" in the position to which it has been moved, thereby maintaining continuously the auxiliary returning pressure of the spring on rod "b" which co-acts with lever No. 1, and this pressure will be thus maintained until lever No. 1 does return to its normal position and thereby open the contact which closes the circuit through the magnet that actuates the friction returning device.

Q. 144. And when will lever No. 1 and the core of the solenoid connected with it be permitted so to move under the thrust of the rod "b" and respective spring between such rod "b" and lever No. 1?

A. When the speed of the turbine has been reduced to such a point that the voltage from the dynamo, the speed of which is also proportional to that of the turbine, has been brought down to a sufficiently low value, such that the pressure due to the spring of the returning device is slightly greater than the increase in magnetic pull above the normal value, this return of the lever will

take place. This is obvious from the fact that under normal conditions when the returning device is not acting on the lever, and when the voltage of the dynamo, and therefore the magnetic pull of the solenoid is normal, the solenoid pull is just balanced by the counter-balance spring. An increase in magnetic pull must be met by an increase in some opposed force, and must proceed from some source other than the counter-balance spring in order to cause return of lever No. 1 to its normal position, and this is accomplished by the pressure of the spring on rod "b" on the returning device. Therefore, in order to return the lever No. 1 to its normal position, the difference between the normal pull due to the solenoid and the changed pull due to the change in voltage across the terminals of the solenoid, must be slightly less than the pressure produced by the counter-balance spring, with due regard, of course, to the various lever arms through which these forces act, or, in other words, the moments of these several forces.

Q. 145. And is this relation between variation of solenoid energization and action of the returning device also true consequent upon a diminution of speed of the water wheels?

A. Yes. I attempted to make my answer to your previous question in regard to this general by using the word "change in" instead of "increased in."

Q. 146. And, when, with respect to the production of water-wheel-gate position with respect to that position proper in accordance with the new load indicated by change of speed of the water wheel, will occur this effectual action of the returning device, after its period of feeling-out, lever No. 1, and the core of the solenoid

accompanied by slippage of the discs of the friction clutch of the returning device?

A. The return of lever No. 1 to its normal position may in some cases coincide with the movement of the gate to its proper new position for change in load. In such case, however, this would happen only for some specific load variation and degree of opening of the gates at the time that governing might take place. Generally speaking, lever No. 1 will be returned to its normal position somewhat in advance of the time at which the gate of the turbine will reach the new position which is proper for and corresponds with the new value of the load.

Q. 147. And the gate will remain in that proper position for the new value of the load without departure therefrom to cause a governor-hunting or oscillating governor action? Is that correct?

A. Yes. There will be no force tending to cause the controller to move, and thereby cause movement of the governor to such a degree as will carry the opening of the water-wheel gates for increase in load, or closing for diminution of the load, past the point to which they should go. It is quite probable in many instances that the governor will not in one cycle move the gates completely and exactly to the points to which they should go, but will move them nearly to this position, and will take a second movement of comparatively short duration and extent to complete the final adjustment of the gates. But in no case will the gates be moved past the proper position to which they should go, assuming, of course, proper design and adjustment of the governor.

Q. 148. And in which of such sequence or steps of governing action does the returning device still act in a

restraining sense to prevent such overrunning of the governor and over-gate movement?

A. Always will the returning device act except in the extremely improbably case of less than 10 degrees of rotation of shaft No. 2, which, since it makes a complete rotation in one-fifth of a second, is hardly conceivable.

Q. 149. There are still certain parts of the previous question which I believe are not answered, namely, as to the dates upon which these five sketches of "Complainant's Exhibit Lyndon Early Construction Sketches and Identifying Affidavit" were made by you, and the circumstances under which such sketches were made by you. Please tell us about these points.

A. The dates are marked on the sketches and, as these were made by me personally and bear my initials and all the wording thereon is written in my handwriting, I know that the dates given on each of these sketches are correct.

Q. 150. Please state what those dates are, tying each date to the respective numbered sketch.

A. On Sketch I the date is April 21, 1899; on Sketch II the date is April 22, 1899; on Sketch III the date is marked "Rough May 30, present—" meaning the date of the actual sketch—"June 15, '99." These mean that the rough sketch was made on May 30, showing all these parts, and a cleaner and better proportioned sketch, made from the rough sketch, was made on June 15, 1899, which latter is the sketch here, marked Sketch III. Sketch IV has no date, and I am unable to assign any date to it, but I am sure it was made sometime after the sketches I, II and III, possibly as long as two months after that. Sketch V is dated June 28, '99. This sketch

I remember to have been the last one of a number of sketches which preceded it, in which previous sketches I was attempting to devise an arrangement whereby only one contact would be required to actuate both of the auxiliary magnets instead of a pair of contacts, one at either end of the lever carrying the main contacts, through which the main operating magnets were energized. I remember to have spent some time on this before I finally reached the construction shown in Sketch V, in which lever No. 2 has its right-hand side depressed, whether the solenoid moved upward or downward. The purpose of these sketches was to instruct the draughtsmen of the York Manufacturing Company, which company had agreed to undertake to develop the device commercially and obtain the United States patents, not only on the broad principles of the invention, but also on such details as might be developed in the course of bringing it to definite mechanical operating form, and to market the device in connection with a proposed output of water wheels.

Q. 151. What did you do with these sketches when they were completed?

A. I sent them to the York Manufacturing Company.

Q. 152. And how did you come to obtain them again?

A. On the request of Mr. Henry I wrote to the York Manufacturing Company asking them for such records as they might have preserved, showing the time at which we had entered into an agreement and the time at which they undertook to reduce this invention to commercial practice. And these drawings were returned to me by Mr. Shipley of the York Manufacturing Company.

Q. 153. And who made each one of these sketches, and every part and parcel thereof?

A. I did, personally.

Q. 154. This is the York Manufacturing Company, is it, with whom you have testified you took up the question of manufacturing the water-wheel governor in accordance with the invention of the patent in suit sometime about the first of the year 1899?

A. Yes, that same York Manufacturing Company.

Q. 155. Now, referring to the blueprints being part of "Complainant's Exhibit Lyndon-York Manufacturing Company Blueprints and Identifying Affidavit," and without going into details, what do these blueprints show?

A. One of these blueprints, the one marked "Electromechanical Water-Wheel Governor," is a diagrammatic representation of the various parts of the governor which was made to guide patent attorneys in taking out a patent which would cover all the features that are covered by the patent in suit. These were made for Mr. Bailey, while the patent in suit was taken out by Knight Brothers.

Q. 156. And, briefly, what do the other blueprints of this group disclose, without going into detail?

A. There is another blueprint which shows practically the same parts as shown in the blueprint labeled "Electro-Mechanical Water-Wheel Governor," but this second print omits the drawing of the turbine and the bypass valve and the electrical connections, and it is my understanding that this second-named print was first sent to Mr. Bailey and he required a fuller and more complete print, and that the one I have first described

was then prepared and sent him, in order that he might have all the data for the preparation of the patent. The print marked "Lyndon's Water-Wheel Governor No. 5852," is the assembly for an actual shop design for the manufacture of the governor. There have been in this print certain changes made in the method of actuating the by-pass valve and returning it slowly to its normal position, although the principles have been maintained the same as those originally proposed. Also, the blueprint labeled "General Design No. 2 of Lyndon Water-Wheel Governor, No. 5922," is another drawing for the reduction to practice of the features of my invention, but additional improvements in design have been made over the first-named shop design.

Q. 157. Now, did you furnish any other sketches to the York Manufacturing Company prior to the making of the blueprints just referred to and in addition to those of the "Lyndon Early Construction Sketches and Identifying Affidavit?"

A. Yes; I made a great number of sketches relating to the details of the device, and as the practical design of the machine took form new ideas would occur to me, not of the application of principle, or any change in the characteristics of the invention, but improved mechanical design which would tend to make the machine better in appearance, cheaper to manufacture, more easily adjusted in operation and, in some cases, to better fulfill the requirements of the conditions called for by the invention.

Q. 158. And what relation, if any, was there between such further sketches and the disclosures of these four blueprints of the exhibit we are discussing?

A. These further sketches were partly the outcome of the representations shown in these prints, and partly the outcome of more prolonged study of the actual mechanical requirements.

Q. 159. Do you mean that the sketches were the outcome of the blueprints, or that the blueprints preceding the sketches were in the hands of the York Manufacturing Company prior to the making of these blueprints?

A. No. I had not finished my answer. The first blueprints were made from and in accordance with a set of sketches I furnished the York Manufacturing Company. After studying these I made certain changes which I indicated by sketches, and from these came a second blueprint which is the first of the before-mentioned shop drawings. After studying this blueprint I made a third set of sketches improving on this first shop drawing, and sent these sketches to the York Manufacturing Company, and from this last set proceeded a second design called "Design No. 2," on the blueprints.

Q. 160. Then, as I understand it, all of these blueprints, as to their showing, were built upon disclosures to the York Manufacturing Company by you. Is that correct?

A. Yes.

Q. 161. How did you obtain these four blueprints?

A. These four blueprints in evidence here were obtained from the York Manufacturing Company sometime during the month of August, 1913.

Q. 162. And you obtained them from whom?

A. From the York Manufacturing Company.

Q. 163. Please, now, briefly compare the disclosures of the five sketches of "Complainant's Exhibit Lyn-

don Early Construction Sketches and Identifying Affidavit," with the disclosure of "Complainant's Exhibit A," a copy of the patent in suit, and in so doing, merely take the various groups of elements and features in each instance, and allocate them with the corresponding features and groups of the other, without going into any further description or general statement of operation.

A. Sketch I is a shop detail of the magnet which in the patent drawing is marked "15" and also "16," there being two of these magnets required for each machine. Sketch II shows the moving armature cooperating with these two magnets and marked "17" in the patent drawing. Sketch III shows a general assembly comprising the first shaft corresponding to shaft No. 6 in the patent drawing, "Main Drive Pulley" corresponding to gear numbered "5" in the patent drawing. A dynamo drive corresponding to the pulley numbered "7" in the patent drawing, ^{two} for beveled gears numbered "9" and "10" in the patent drawing, these meshing with a large bevel gear which is numbered "11" in the patent drawing. A longitudinal sliding member for clutching in either of the bevel gears, which is numbered "13" in the patent drawing. The lever "14" of the patent drawing, and the two springs, one on either side of the lever, which springs have no numbers, correspond with the magnet lever and springs which operate the sliding member before described and shown in Sketch III. The second shaft in Sketch III corresponds with the shaft numbered "12" in the patent drawing. The worm shown on the second shaft in Sketch III corresponds with the worm numbered "18" in the patent drawing. The friction-returning device shown in Sketch III and comprising a

magnet, a lever and two sliding discs, is shown in the patent drawing by the magnet "32", the lever "24", and the two sliding discs "22" and "23". The rod of the returning device lettered "b" in Sketch III is shown in the patent drawing and numbered "25a". The third shaft of Sketch III is shaft numbered "20" of the patent drawing. The lever and weight for returning the compensating-valve-actuating mechanism to its normal position is not present in the patent drawing, weights attached to a rope connection from the ^{sheave}~~sleeve~~ wheel attached to the friction clutch being substituted in the patent drawing, which weights are numbered "70". The friction clutch for actuating this last-named mechanism, comprising a magnet, an operating lever and a sliding member constrained to rotate with the shaft which makes frictional contact with another member free on the shaft, are shown in the patent drawing, the magnets being numbered "64", the lever "61", and the friction clutch being numbered "57" and "58". The flange coupling of Sketch III corresponds with the bevel gear numbered "21" in the patent drawing.

Q. 164. Let me interrupt at this point and ask you in what sense you meant the application of the clutch disc "22" and "23" are slidably mounted in the drawing of the patent in suit in the comparison you have made?

A. I meant that one of these, the part marked "23", was keyed to the shaft, but could slide longitudinally along the shaft; part "22" was free to turn about the shaft, and when part "23" is slid along the shaft until it makes contact with part "22" and is pressed against it by the operation of the operating magnet, the part

"22" is then constrained to rotate within the limits of its ability to rotate with part "23".

Q. 165. And are both of the discs of the friction returning device in Sketch III slidably mounted, or how?

A. The disc "22" ^{being} ~~before~~ free to move in any direction on the shaft except in so far as it is restrained by collars or journal boxes against which the hub may press, is slidable within these limits, while the disc numbered "23" is also slidable within the ^{shaft} ~~first~~ limit of operation, which limit is found in the travel of the armature from normal position to the face of the magnet toward which it is moved when the magnet is energized. In Sketch III the disc which corresponds to disc "23" in the patent drawing, is limited in its motion along the shaft by the limits of the operation of the lever by which this disc is moved longitudinally along the shaft; while the disc which corresponds to No. "22" in the patent drawing is prevented from sliding along the shaft when the first named disc is pressed against it by means of the collar fastened on the shaft behind this second-named disc. Sketch IV is a sketch of the weight meant to produce a force to return the compensating valve to its normal position, and corresponds to the weights marked "70" in the patent drawing. Sketch V shows a supporting spring marked "Spring No. 1" which corresponds to the supporting spring marked "37" in the patent drawing, and the solenoid shown in Sketch V corresponds to the solenoid "33" shown in the patent drawing. There is a soft iron core which operates in the solenoid and corresponds to the core marked "34" shown in the patent drawing. There is an operating rod attached to the solenoid core shown in Sketch V which cor-

responds with the extension of the core marked "35" in the patent drawing. There is a pivoted lever marked "Lever No. 1," in Sketch V and shown in the patent drawing and marked "26." There is a pivot about which this lever turns called "Pivot No. 1," in Sketch V, and marked "26a" in the patent drawing. There is a member to break contact at each end of the lever No. 1, marked "40" and "41" on the patent drawing. There is a connection between the operating rod and the lever No. 1 shown in Sketch V and shown in the patent drawing, being numbered "39." There is a rod which passes vertically up through the lever marked "b" in Sketch V and numbered "25" in the patent drawing. There are two springs on this rod, one being above and the other below the lever, as shown in Sketch V. These same two springs are shown in the patent drawing numbered respectively "27" and "28". There are two rough pencil indications of returning springs on rod "b" in Sketch V, which springs are also shown in the patent drawing, being numbered "29". There is a second lever called "Lever No. 2," shown in Sketch V, having a curved slot in one end and a make-and-break contact in the other end, and a bell-crank operating in the curved slot, which bell-crank is moved by the operating rod from the solenoid. These parts are all shown in the patent drawing, the lever being numbered "43", the slot numbered "44", the bell-crank numbered "42", and the single contact shown in Sketch V is increased to four contacts in the patent drawing, numbered "45", "46", "103" and "104". At the lower end of the operating rod is a spring which is in tension opposing the pull of the solenoid, and marked "Counter-

balance Spring'' in Sketch V, which finds its counterpart in the patent drawing in number ''38''.

Q. 166. Aside from the release rod and lever No. 3 and the make-and-break contact device in Sketch V, are there any of the general features and elements disclosed in these five sketches which do not enter into the disclosure of ''Complainant's Exhibit A,''' the patent in suit, with respect to general purpose and function?

A. No.

Q. 167. Please now compare the disclosure of ''Complainant's Exhibit Lyndon Reproduction Sketch of his Disclosure Sketches of June and July, 1898,''' with the disclosure of ''Complainant's Exhibit A,''' the patent in suit, by similarly allocating the several elements and groups of elements in that sketch with the counterpart features disclosed in the patent in suit.

A. There are shown in this sketch the turbine case, and projection therefrom; the main drive-shaft, which latter is not connected with anything, its mechanical connections with the other parts being understood to exist without any indication of this part in the sketch; the three bevel gears which mesh together; the clutch operated by the electro-magnets through the intervention of a lever and the pivot about which the lever turns; together with a short piece of shaft on which the two similar bevel gears and the clutch are mounted, are all shown. This short piece of shaft which corresponds to shaft numbered ''6'' of the patent drawing, is not shown as connected with anything else, and the method of driving it is not indicated, it being understood that any satisfactory means of causing continuous rotation would suffice. Also, the bevel gear corresponding to that one

shown in the patent drawing and numbered "11" is shown as being directly mounted on the gate shaft, it being usual in making rough, explanatory sketches to omit all well-known intervening mechanical devices when the novelty to be ^{found}~~discovered~~ resides only in the method by which a result is produced from the action of one device on some other device. The penstock leading into the turbine case, corresponding to the pipe marked "1" in the patent drawing, is shown. Also the by-pass pipe which is shown in the patent drawing and numbered "47". The by-pass valve is also indicated, which by-pass valve is shown in the patent drawing and numbered "48". There is the indication of a dashpot attached to the by-pass valve, its method of attachment and operation not being stated or indicated, it being understood that the dashpot would be connected in some well-known and approved manner, to prevent rapid return motion of the by-pass valve. This dashpot finds its counterpart in two dashpots numbered "69", as shown in the patent drawing. The shunt-wound dynamo, indicated by the word "Armature", supplying current to the controlling solenoid and corresponding to similar parts in the patent drawing, are shown in the sketch. Also the oscillating lever in the sketch corresponds to the lever numbered "26" in the patent drawing, and the two main contacts of this lever by which electrical connection is established from a source of electrical energy through the main operating magnets and corresponding to contacts "40" and "41" of the patent drawing, are also shown in the sketch. The suspension spring of the solenoid corresponding to the spring "37" of the patent drawing, is not shown in the sketch, it being intended that a usual

and standard method of supporting the solenoid core would be used. One auxiliary contact is shown on the oscillating lever, which contact is meant to produce electrical connection from a source of current supplied through a magnet winding to operate the friction returning device, which corresponds with the parts shown in the patent drawing and numbered "22", "23", "24" and "32". The rod of the returning device, corresponding to the part shown in the patent drawing and numbered "25" and "25a", bearing springs at the upper end of this rod, corresponding to springs "27" and "28" in the patent drawing, are also shown. The springs for returning this rod to its normal position and with it the disc to which it is attached, shows in the patent drawing and numbered "29", are omitted from the sketch, it being understood that some well-known method of returning the rod and disc to normal position would be used. The counter-balance spring shown in the patent drawing and numbered "38" is also shown in the sketch. The means of operating the by-pass valve which are disclosed and indicated in the patent drawing, are not shown in the sketch further than the mere statement "inverse connection", it being understood that as the gate-shaft would rotate in either direction the by-pass valve could be made likewise to rotate in either direction, and it would be merely a matter of mechanical connection to make the closing of the water-wheel gates inverse to the opening of the by-pass valve.

Q. 168. Are there any of the general elements, features and inter-relations disclosed in this sketch which are not found in counterpart in the disclosure of "Complainant's Exhibit A," the patent in suit?

A. No. Everything shown in that sketch is included in the drawing of the patent in suit, so far as the representation of the parts in the sketch applies to the principles and methods involved.

Q. 169. I notice that in this sketch you show two sources of electrical energy, one being the conventional showing in circuit with the oscillating lever actuated by the solenoid core for operating the several magnets of the controlling system, and a circuit electrically supplied by the generator, and in which circuit the controlling ^{Solenoid} is included. How does this provision of sources of electrical energy in the sketch compare with the provision of those in the patent in suit?

A. The patent in suit provides only one source of electrical energy, which is the controlling dynamo. It was never my intention to use two sources of electrical energy, but it is customary in making sketches to simply use at some convenient point an indication of a course of electrical energy that may be convenient, so as not to confuse the sketch with the indication of too many circuits. That, therefore, simply means that electrical energy from any convenient source may be used, though, obviously, the most convenient source would be from the generator which is an inherent part of the governing mechanism.

Q. 170. Please sketch now further the development of your dealings with the York Manufacturing Company, which commenced, as you say, about the first of 1899, with relation to the governor, being the subject of the patent in suit.

A. Would it be proper for me to read over the correspondence or copies of correspondence from the York

Manufacturing Company to refreshen my memory, and thereby make briefer the statements I may have to make?

Q. 171. You have vouched for these letters, and there is no objection to your referring to them, they being in evidence, if you wish to, and you may do so, but I wish more particularly to have you briefly outline the progress of your negotiations with the York Manufacturing Company and what was the eventuation of these dealings, mentioning times and names or persons involved. If you wish to specify any particulars, you may refer to the exhibit mentioned.

A. I first took up the matter with the New York representative of the York Manufacturing Company, who was also in charge of all exports of this company, Mr. David S. Hays. I had not been in the New York ~~office~~ ^{office} of the American Trading Company any considerable length of time, and I was extremely busy with my normal duties as chief engineer of that company, and all negotiations with Mr. Hays which took the form of interviews at opportune times necessarily occupied more time than they would have if I had been free to give all of my time to such negotiations. After talking over the matter with Mr. Hays on several occasions, he decided to bring it to the attention of his principals at York, which he accordingly did. After the lapse of some time, the length of which I am ^{not} now able to state, Mr. Shipley came to New York and we discussed the subject further. Mr. Shipley expressed himself as approving the idea, and said that they would undertake to develop this invention, put it on the market under certain conditions, and, after some further correspondence, this work of development was actually begun. I made a number of

sketches and sent them to them and after considerable time finally got a drawing from them, or, rather, a blueprint, after which I made other sketches and sent them to the York Manufacturing Company, and these sketches resulted in other blueprints, which process was repeated possibly three or four times. At about this period the York Manufacturing Company was extending its business considerably, and, according to the representations of Mr. Shipley to me, the draughting room of his company was over-crowded with work and for a considerable length of time he was obliged to set aside this development of the water-wheel governor until the rush of work in the draughting room could be handled and disposed of, and arrangements made to again take up and carry on the work of designing from the point it had reached at the time he was obliged to cease work on it. I assented to these conditions, and it was not until near the end of 1899 that the final assembly drawing which we considered satisfactory was produced. My memory is that between eight and ten months had been consumed between the time which elapsed from the beginning of work in the draughting room of the York Manufacturing Company and the completion of this last design, which is shown in one of the blueprints that form part of the exhibit in this case, and which is labeled "Design No. 2." I do not know how far the York Manufacturing Company proceeded after that time with the detail drawings of the various parts, but some time after the final drawing before referred to was made, the York Manufacturing Company for reasons which I have elsewhere explained decided not to engage in the manufacture of any hydraulic machinery. I consented to release

the company from its agreement with me, and something like a year or more after I had first opened up the subject with them this agreement was abrogated and was without any progress toward the development and marketing of this machine, except that which had been made in the draughting room of the York Manufacturing Company. Also, in the early part of 1899, the York Manufacturing Company, in accordance with its agreement with me, sent drawings to Marcellus Bailey, Patent Attorney in Washington, with instructions to prepare patent specifications and claims covering this invention, and from the knowledge which I have been able to obtain, Mr. Bailey laid this matter aside until he felt that it would be opportune, and he had ample leisure to handle it. My memory further is that I went to Mr. Bailey's office in the spring of 1900 and finally got from him such papers as he had that bore on the subject, and during that same year turned them over to Knight Brothers for the purpose of obtaining a patent, and the obtaining of the papers from Bailey's office finally closed the relations I had with the York Manufacturing Company in connection with this invention, until in 1913 I requested them to give me such copies of such letters as they had which passed between us and referred to it, and such other documents and data as would assist in establishing the date of the agreement between us and the beginning of their work in its development, which request I made of them sometime during the summer of 1913.

Q. 172. As to the papers which you obtained from the patent attorney Bailey and took over to Knight Brothers in New York, do you know where they are now?

A. I have no idea, unless Knight Brothers have kept

such documents in their files, and it is quite probable that they have not done so, not only because of the period of time which has elapsed, but also, because Knight Brothers moved their offices from No. 20 Broad Street to No. 2 Rector Street, and undoubtedly went through the usual process of clearing out a large number of old and apparently useless papers at that time. I have never asked Knight Brothers whether they still possessed these original documents or not.

Q. 173. Are you prepared to state whether there was a written agreement entered into between yourself and the York Manufacturing Company concerning the proposals for manufacture which you have been testifying about?

A. I do not now remember. I am inclined to think that any agreement that we had was in the form of a letter from me to them and a reply from them to me in which they assented to the proposal that I had made in my letter. I seriously doubt whether either of us would have proceeded on a mere verbal agreement, but I, at this time, have no recollection of the agreement nor what its terms of compensation to me were to be. I only recall that the York Manufacturing Company undertook to commercially develop and to patent this invention.

Q. 174. Please now state what, if any, further efforts you made in connection with the introduction or exploitation of the invention of the patent in suit after you placed the matter of patenting this invention in the hands of Knight Brothers.

A. In the early part of 1900 I left the American Trading Company and went to Baltimore, where I remained until about October of that year. During this

time I brought the invention to the attention of several individuals and manufacturers in the hope of getting them to manufacture the device on a royalty basis, but did not succeed in interesting any of them. In 1901 I returned to New York and persisted in the effort to make some disposition of the invention. In the summer of 1901 I was retained by the National Battery Company, and the work of this company took me to Buffalo, New York, frequently. During several of my visits to Buffalo I attempted to interest parties there, notably Mr. Burtis, who was president of the Howard Iron Works, and at one time Mr. Burtis accompanied ~~me~~ to Niagra Falls and introduced me to the engineer of one of the power companies near Niagara Falls and whose name I at this time have forgotten. This engineer approved the method of governing which I had developed, and said that he would purchase one governor on trial, and we made a tentative arrangement for supplying one of these machines, it being the intention to have the Howard Iron Works build it. I made some further sketches to reinforce such drawings as I had already made, and tried to induce Mr. Burtis to go ahead with the work of building one. He kept deferring the matter, and the engineer to whom I had agreed to supply it could not wait an indefinite period of time for the machine, and, therefore, withdrew from his original promise to purchase one. I spent considerable time in such efforts, and, among, others, approached Mr. John Bogart in New York, who expressed himself favorably concerning the machine, but said that he could not do anything toward having it manufactured, although as an engineer, he would be glad to obtain such machines for the government of water wheels in water

powers that he was then acting as engineer for. I made continuous efforts in every available direction, it being my desire to have the machines manufactured and sold, and a royalty to be paid to me on each machine, as I did not desire to sell the patent. About 1904 I interested William Ross of New York, who at that time was engaged in manufacturing and marketing automatic stokers for boilers. Mr. Ross at this time was having his stokers built by the Kutztown Foundry & Machine Works of Kutztown, Pennsylvania, of which Mr. Irvin Bair was general manager. Mr. Ross and myself, after some negotiations, reached an agreement, and under this agreement complete shop drawings were made for a governor, and construction work begun in the works of the Kutztown Foundry & Machine Works. Most of the parts of this machine were completed, and a controller was built by the Ball Electric Company of New York. About the time that the parts of this machine were finished, Mr. Ross and the Kutztown Foundry & Machine Works had a disagreement about the payments which were due to the latter company by Ross for stokers which they had supplied him. Due to this disagreement, the Kutztown people declined to finish the governor and also declined to let Mr. Ross have the parts so that we could finish it. And, so far as I know, the parts for that machine are still in Kutztown. This new negotiation and final failure consumed about a year, if my memory is correct. Subsequent to the final cessation of any relations between Ross and myself which, I should say, occurred in the latter part of 1905 or the early part of 1906, I began offering this patent for sale to various manufacturers of water-wheel governors, having by that

time practically given up the idea of getting any manufacturer to undertake to build and market it on a royalty basis. Among others, I carried on some negotiations with the I. P. Morris Company of Philadelphia. Just about that time I discovered that the Allis-Chalmers Company had infringed my patent in the application of the by-pass valve, operating under the conditions of my invention to a governor which they supplied to the Great Northern Power Company, at or near Duluth, Minnesota. I brought the attention of the company to this infringement and made an effort to get them to settle for the infringement and to purchase the patent, but without success. I, of course, realized the impossibility of my successfully contending with the Allis-Chalmers Company in court, as I knew enough about patent suits to know that it is unwise to embark in one, unless the litigants have both the time and money to carry it to a successful issue, and, as I had neither, I brought no suit against them, although I made a number of efforts to induce them to make a settlement and to purchase the patent. I also discovered that the Pelton Water-Wheel Company were infringing this patent, and I had two or three interviews with the New York representative of this company, Mr. Kunze, and the only result of these interviews was a flat declaration that the Pelton Company did not infringe my patent. I have never missed a opportunity to bring this to the attention of a possible purchaser, and there is not a manufacturer of water-wheel governors in America that has not had this patent brought to his attention by me for the purpose of either making an arrangement to have it made on a royalty basis, or a sale of the patent.

Q. 175. Machines embodying the invention of the patent in suit are expensive to manufacture, are they not?

A. They are expensive to manufacture, expensive to sell, and cannot be successfully made and sold, so far as financial returns are concerned, without a considerable capital and a well-organized factory staff and a complete and thoroughly able selling organization.

Q. 176. And such machines or apparatus are usually built upon specifications which vary, do they, with respect to the particular requirements of the installation to include the same, such as to the power available, and such like?

A. Yes. There are comparatively few water-wheel governors of any size or importance that are absolutely standard stock machines. While a large number of the parts which enter into the make-up of a governor may be made of a fixed design, there are usually special conditions that have to be met for each installation of water wheels.

Q. 177. And have you at any time since creating this invention of the patent in suit been in a position, because of manufacturing facilities, or the financing of such manufacturing enterprise, to manufacture and supply properly governors embodying your said invention to the general field of this invention?

A. No. I have been continuously engaged in professional work since the latter part of 1900, and it has taken practically my entire time to derive a sufficient revenue from that to meet my needs; and, even if I had a small amount of money to invest, it would have been impossible for me to give my time to the work. I had neither

the money nor the time to give to it, and it was an utterly unthinkable thing that a man whose time was totally occupied and who was without funds should attempt to embark in any such enterprise as the manufacture and sale of water-wheel governors.

Q. 178. And during all the period of time since you made this invention you have had more or less occasion to travel about the world in connection with your engineering business?

A. Yes.

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Q. 179. In addition to your practical work in the practice of your engineering profession, including your work in the field of which you have told us, have you written any treatises, articles, or the like, pertaining to engineering subjects for publication? If so, please state by what means the same were published, and the approximate dates of publication.

A. Yes; I have written several articles, books and monographs on technical and scientific subjects. The most important ones which I now remember are on the "Design of Tractive Electro-magnets," which was published in *The Electrical World* about 1900; a series of articles on "Electrical Systems of Distribution," which appeared in *The Electrical World* in 1901; a series of articles entitled "Physical Conceptions of Alternating Current Phenomena," which appeared in *The Electrical World* in 1904; a paper presented before the American Institute of Electrical Engineers on "Comparisons of the Behavior of Floating and Booster Controlled Storage Batteries under Fluctuating Loads," presented in 1902; a paper before the American Institute of Electrical

Engineers on "A New Method of Turbine Speed Control," the date of which is 1906, as determined by reference to a copy of the publication; a paper before the American Institute of Electrical Engineers on "The Corona and its Effect on Design of High Tension Transmission Lines," presented in 1906. The books I have written are "Storage Battery Engineering," which work has been translated into French and has for the past ten years been the standard in the English language on the subject of the storage battery, and its engineering applications. I understand from the publishers that it is used as a standard and text-book in about twelve American Universities, by the United States War Colleges, by the technical corps of the United ^{States} Army and Navy. It has never taken the same rank in France, and I am informed that the reason for this is that it deals almost entirely with American practice. Another book is entitled "The Development and Electrical Distribution of Water Power," which, I understand is regarded as one of the standard works on this subject. That was published, I believe, in 1907 by John Wiley & Sons, of New York. I also wrote two sections for "Foster's Electrical Engineers' Handbook," the two being the sections on the storage battery and that of "Resonance in Alternating Current Circuits." I also edited the section on Electricity and Magnetism for the "New Editor's Encyclopedia," and I collaborated in writing the section on "Traction" in the new edition of the Encyclopedia Britannica.

Q. 180. Have you had occasion in your experience to deal with water supplies from varying sources and

of varying descriptions and nature in connection with hydro-electric unit installations?

A. Yes.

Q. 181. I now show you "Complainant's Exhibit Bottle of Kern River Water at Power Development Company Plant," and I will ask you to inspect the same optically and state whether you find the same to have any content of finely divided stone, schist or like material.

Mr. Westall: The question is objected to on the ground that the witness has not been qualified to testify as an expert respecting the various kinds of water that flow in the various rivers which are used to propel water wheels, and that the question calls for expert evidence as to the condition of water, which is not within the issues of the present case.

A. There is nothing visible in this sample of water submitted for inspection that is either hard or has a specific gravity that in any wise would approach that of sand, schist or other stony substances. The water appears to be clear, with the exception of a few deposits of a flocculent material which sinks very slowly through the water, and appears, a portion of it, to float, remaining in whatever position it happens to have been put, thus indicating that the specific gravity is approximately that of the water itself. If this sample is a true sample of the water of the stream from which it was taken, it represents the best condition that I have personally ever encountered, so far as wear or abrasive action on water wheels or parts of hydraulic machinery through which this water may pass, is concerned.

Q. 182. By Mr. Blakeslee: In your numerous references during your testimony to the patent in suit, "Com-

plainant's Exhibit A," as, for instance, in comparing with the disclosure of the same disclosure of "Complainant's Exhibit Lyndon Reproduction Sketch of His Disclosure Sketches of June and July, 1898," and in similarly comparing with the same the sketches of "Complainant's Exhibit Lyndon Early Construction Sketches and Identifying Affidavit," you have pointed out the several main elements and groups of inter-related elements of that embodiment of your invention which you commenced to build up and organize, more particularly from the date of the disclosure to Mr. Meyer before the first of August, 1898; and have particularly set forth as the main framework of such construction the water-wheel gate or gates, the pipes and by-pass and by-pass valve, the means of producing slow closing or returning movement of the by-pass valve, the speed-sensitive device, the means responsive to the action of the speed-sensitive device for inversely actuating the water-wheel gate or gates and the by-pass valve, and the returning device for affecting the operation of said last means, to prevent over-running of the governor or to bring the water-wheel gate or gates to its or their proper position for a change in speed of the water wheel, and to hold the same at that point. You have likewise referred to various electrical and electromagnetic devices and features, such as circuit wires, contact devices, solenoids and the like, as incorporated in the general system, including the mechanical features or mechanically performing features above mentioned, as constituting the general framework of the embodiment of the invention. Will you please state why, in the working out of such embodiment of the invention, you resorted to the use of such

electrical and electromagnetic devices for the transmission of energy, and the setting into operation of mechanically working features, instead of having recourse to purely mechanical features in these respects?

Mr. Westall: Counsel for defendant objects to counsel testifying and dictating a deposition in the form of a question. The question obviously endeavors to construe the previous testimony given by the witness to describe certain functions and relations which are not to be found in the previous testimony of the witness, and are conclusions of counsel based rather upon what he would like to have the record show than upon what it actually does show. There is a lack of connection between the long statement of the first part of the question and the question proper, which makes this attempt very obvious. Also, that the question is irrelevant, immaterial, incompetent and not proper rebuttal testimony.

Mr. Blakslee: We call again the attention of the Examiner to Equity Rule 51, and require that he comply with the provisions of such rule with respect to argumentative and high-sounding alleged objections just put on the record. The question speaks for itself with respect to the record in this case, and that is all there is to be said in response to the alleged objection.

A. As I understand the question, it is desired to know why I adopted electrical means for effecting the functions and producing the mechanical performance of the various objects which I desired to attain, through electromagnetic means. My answer to this is that I believed, and still believe, that the use of a solenoid with a variable voltage and variable speed under-saturated dynamo is the most sensitive controlling device that can be pro-

duced. Starting with this, it followed logically that the other portions of the governor would be made to be actuated electromagnetically, and energy would be conveyed, therefore, over wires from point to point of the machine rather than by any other means. Furthermore, my state of mind was at that time almost entirely electrical and magnetic, so far as any industrial or scientific applications were concerned. I had been more deeply interested in the study of electricity and electro-magnetics than any other scientific study, and had persistently followed this, almost to the exclusion of any other branch of the industrial arts. It therefore was logical that I should have adopted electrical energy and the usual means for transmitting this energy from one point to another throughout the machine, rather than other forms of energy for the corresponding methods of transmitting these other forms to the different portions of the device.

Q. 183. By Mr. Blakeslee: In any instance, entering into the embodiment of the invention of the patent in suit, as set forth in the specifications and drawings of said patent, is there lacking a distinct mechanical action in the performance of the intended function, although the respective feature be set into play electrically or electromagnetically?

Mr. Westall: Objected to on the ground that the patent speaks for itself as to what it contains and what it lacks, and that the question is otherwise incompetent, irrelevant, immaterial, and not proper rebuttal.

Mr. Blakeslee: We point out in this connection that the testimony of this present witness with respect to the nature of this invention which he has created is

most competent, and we further point out that we are desirous of showing the court, because of the attempts by the defendant to show the contrary, the specific, simple, direct and unfailing action of the construction disclosed in the patent in suit.

A. The fact that in its final analysis this governor is a machine, indicates that there can be no mechanical element lacking. If there were, it would be an incomplete and inoperative device. The portions of the machine are caused to act in accordance with changes in speed or other external conditions, by means of energy which simply, according to my own personal preference, takes the form of electrical energy, but this in no wise differentiates it from any other machine the parts of which are caused to act by any convenient or available form of energy.

Mr. Westall: I move that the answer be stricken out on the ground that it is argumentative.

Q. 184. By Mr. Blakeslee: Please compare briefly the transmission by electricity or by an electrical path, including an electrical magnet, with purely mechanical transmission, with respect to positiveness and effectiveness and quickness.

Mr. Westall: Objected to as vague and indefinite, and also on the ground that it is incompetent, irrelevant, immaterial and not proper rebuttal. The issues do not in any wise concern electrical transmission, but rather the various devices and means by which certain results might be obtained.

Mr. Blakeslee: In other words, as we understand the objection, a transmission may be considered mechanical

or anything else, although the disclosure is with respect to what apparently are electrical paths.

A. I believe that there are mechanical means which are as positive and effective as electrical means for transmitting controlling energy from one point to another in water-wheel governing. Also, the final action of a strictly mechanical, as opposed to an electro-mechanical governor, should give an operation within practically the same time-space. I believe that electro-mechanical devices can be arranged more conveniently and more cheaply and can be better adjusted than strictly mechanical devices where varying and intermittent action of the machine may be required.

Q. 185. By Mr. Blakeslee: And in a long and devious path of transmission, what have you to say with respect to the lost motion entering into mechanical transmission as affecting the positiveness of such train, in comparison with the positiveness of action through an electrical path?

A. In case of a strictly mechanical connection for the transmission of energy, where the direction of transmission is changed, there will be lost motion, and, therefore, a comparatively different character of mechanical transmission, except when the workmanship is of a high order, and during that period of the life of the machine when wear on the parts has not reduced the efficiency of transmission. In a case where the workmanship of a strictly mechanical transmission is not of the best, or where there has been considerable wear of the parts, even though they at first were well made, mechanical operation of any machine which depends on the maintenance of the exact relations of these parts is neces-

sarily less exact than in the case of electrical transmission in which the character of the transmission is not affected either by workmanship or wear.

Q. 186. Then, with respect to a governor performing functions of that disclosed in the patent in suit, what would be your preference in constructing such a governor, and even with extensive departures from the specific construction and arrangement shown in the drawings of the patent in suit, when it came to the question purely of energy transmission for setting into motion various mechanical working features of the construction?

A. My preference would be in favor of electrical transmission, not only for the reasons before given, but also because of its low cost and the ability to make changes in the direction of the impulses without changing the mechanical adjustments and parts of the machine.

Q. 187. That is to say, if I understand you correctly, that the machine is more adaptable, and, we may say, flexible, and responsive to varying conditions of service with the use of electrical transmission, inasmuch as inexpensive and light wearing and electromagnetic elements may be used, shifted or adjusted as desired or required, thus obviating the manipulation and adjustment of heavy mechanical transmission devices, such as shafting, couplings, counter-shafting, belting and the like. Is that correct?

Mr. Westall: Objected to as leading and argumentative, and as an attempt on the part of counsel to testify as an expert, without being sworn, and as an attempt to piece out the testimony of the expert with what he would

prefer that the witness say rather than what the witness is actually stating.

Q. 188. By Mr. Blakeslee: We will ask the witness now to say in these respects.

A. My preference would be for electrical transmission, not only for all the reasons which have been cited, but, furthermore, because the electromagnetic means to which the energy is transmitted, are also not subject to wear, and the forces acting remain in constant adjustment, regardless of the length of time that the machine may be in use.

Q. 189. In your previous testimony and in the disclosure of the patent in suit reference is made to a device sensitive to changes in speed of the water wheel, being in the patent disclosure the dynamo "8". Please define what is, and at the time of your invention of the subject of the patent in suit was your conception of such a proper speed-sensitive device for setting into operation the controller of the governor so as to obtain the most sensitive, positive and efficient governing action?

A. At first when I undertook to solve the problem of water-wheel government, I had in mind the use of a mechanical inertia governor. But the idea of using the speed-sensitive electrical device which occurred to me and which is as disclosed in the patent in suit, seemed to give a more sensitive method of control and one in which the elements of workmanship and wear would be practically eliminated, and the adjustment once made would be permanent. This control comprises the use of a small dynamo driven from the turbine, the speed of which latter is to be regulated, and, therefore, the speed of this controlling dynamo will vary in exact pro-

portion to any variation in the speed of the water-wheel driving it. The change in speed produces a change in voltage, due to the change in speed, and this voltage itself reacts on the dynamo, which is shunt-wound, to change the field excitation, which, again, influences the voltage of the armature in accordance with the well-known laws of electro-magnetism. The percentage of change in voltage will in every case be much greater than the percentage of change in the speed of the source from which it is driven. I have previously described an arrangement of a solenoid winding, in which works a soft iron core. The pull of any electromagnetic device varies directly as the square of the magnetic density, and the magnetic density in the case of an iron core where the normal density is not very high, will vary substantially directly with the current which passes through the windings of the solenoid. Since the resistance of the solenoid remains constant after it has once attained its normal temperature, it is obvious that the current through it will vary directly and in accordance with the applied voltage. By transmitting electrical energy from the controlling dynamo to the terminals of the solenoid, the following conditions of any speed change of the turbine driving the controlling dynamo results: For a given speed change, a considerably greater voltage change, for a given voltage change, a considerably greater change in the pull of the solenoid than change in the voltage; if the magnetic densities in the controlling dynamo and in the solenoid core are kept low, the pull on the solenoid core will vary approximately as the fourth power of the dynamo speed. In a mechanical governor the change in the force which it applies to operate any mechanism at-

tached to it, varies about as the square of the speed. From this it follows that the electromagnetic speed-changing device which I invented, and which forms a portion of the subject of the patent here in suit, has a much greater sensitiveness than that attainable with any known form of mechanical governor.

Q. 190. Will the speed-sensitive device of your invention of the patent in suit respond to any other change of condition in the water wheel and generator, or other power consumer driven thereby, than a change in speed of the water wheel?

A. The speed-sensitive device itself does not respond to any condition other than speed change. By the arrangement of the governor mechanism, whenever a speed change of the prime mover is attended by a change in the gate opening, the mechanism which sets the gates in motion is arranged to also apply another and extraneous force to the speed-sensitive device for the purposes which have before been set forth and are described in the patent, and this extraneous force is only added to the other forces acting on the speed-sensitive device when motion of the gate-shaft takes place.

Q. 191. In governing action does the speed-sensitive device of the invention of your patent in suit take into account any changed condition occurring with respect to the water wheel and the parts driven thereby, which cannot be, and, in fact, is not directly expressed in terms of speed-change, or, in other words, respond to any other changed conditions?

A. The speed-changing device of my invention does not respond to any change in the condition of the prime mover except change in speed, except so far as this

change in the forces acting on the speed-changing device is checked by the extraneous force set up by the machine itself, which machine is, in turn, controlled by the speed-changing device.

Q. 192. What are these extraneous forces and the object and effect of the same?

A. If the speed-changing device had no forces acting on it except the electromagnetic force, which varies in its density with speed-change of the prime mover by reason of the intermediary action of the variable-voltage controlling dynamo, the operation of the gate-moving mechanism would have to continue until the speed of the water-wheel which had departed from normal, before the mechanism began to move, had returned to normal. In the case of the arrangement whereby the gates of the water wheel would be moved very rapidly, the space of time required for the water wheel to return to its normal speed would be such that within that same time the travel of the gates would have proceeded to a point beyond the proper value, such that the gate opening would be suitable for the change in load which produced the departure from normal. In order to make this clear, consider an increase in water-wheel speed due to a diminution in load. There is some proper gate opening which is less than the gate opening that existed at the time of the change in load, and which new condition of lesser gate opening corresponds exactly with the load on the water wheel. When the water-wheel gate has moved as far as this point, it should proceed no further. If it does, the gate opening is so far reduced that the speed of the water wheel will not only return from the first condition of excessive speed to normal, but will be further

reduced below the normal speed. This so-called over-running of the water-wheel gates must be prevented by some means, for otherwise, with a change in load, the governor can never bring the water wheel back to its normal speed, but will continue to "hunt" back and forth, closing the gate to diminish the speed, and closing it too far, so that the speed is diminished below normal, and then opening the gate to increase the speed to normal and moving the gate too far in the direction to open them so that the speed increases to normal and goes past normal, when the cycle is again repeated. I have personally witnessed this operation in water-wheel governors and have seen it continue for several minutes until finally corrected by manual action on some part of the governor to arrest its motion. With this explanation, the object of the device for overrunning becomes clear. When the speed of the water wheel increases, the pull on the controlling electro-magnet, corresponding to the increase, causes the contacts to be made whereby the mechanism is set in motion to close the water-wheel gates. As soon as all the parts of the machine are set in motion, the overrunning device acts practically instantaneously, and its action consists in building a force which opposes that first produced by the change in solenoid pull. Therefore, the electro-magnetic controlling device is constrained to return to its normal position prior to the time when the water wheel has returned to its normal speed. When the controlling device returns to its normal position, the operation of the governor acting on the water-wheel gates ceases. If within the interval of time which elapses between the opening of the contacts when the controlling device is returned to its normal position

and actual return of the device to its absolutely neutral position, the speed of the water wheel has reached normal, due to the fact that the water-wheel gates were, in this first operation, moved to substantially the proper degree of gate-opening for a change of load, the operation of the machine is finished, neglecting, of course, any slow return of the by-pass valve. If, however, the friction returning device for preventing over-running has caused the controlling device to return to normal position and break the electrical contacts before the water-wheel gate has reached its proper position suitable for the change of load, then the still unbalanced electro-magnetic pull on the solenoid will cause the contacts to again be made, motion in the same direction as before to still further open the water-wheel gates begins, and instantly the counter-acting force of the over-running device is brought into play and the cycle first described repeated, except that its duration would naturally extend over a very much shorter time, because the water-wheel gates have within the period of the first operation approached more nearly to normal speed, and the unbalanced force acting at the beginning of the second cycle on the electromagnetic controller would be less than during the first, and any force set up by the over-running device would return the controller to its normal position, breaking the contacts almost as soon as the overrunning device would begin to exert its counter-acting force on the controller. It might be that after this second cycle, the water-wheel gate would not quite have reached its final position, and there might be a third motion of the controller, the machine, the over-running device, and the water-wheel gate, which for the same rea-

son before given would endure for a much shorter time than the second cycle. From this it follows that, in general, the operation would be, first, a considerable movement of the water-wheel gates toward the point to which they should be moved for a new load, then and immediately succeeding, a shorter distance of motion of the gates, and then another still shorter motion, so that movement would practically take place in accordance with the curve of speed-change variation.

Q. 193. In your last answer you have referred to "load" in connection with changes of speed on the water-wheel gate. What bearing is there of one upon the other?

A. Assuming a constant head of water acting on the water wheel and the preservation of a constant speed on the water wheel, there is a specific and definite degree of gate-opening, which corresponds to a specific and definite load. Any change in this load must be accompanied by change in gate-opening if the speed is to be preserved substantially constant.

Q. 194 May there be changes of load irrespective of changes of speed, and vice versa, in a given hydro-electric generating plant?

A. Not if the head and the gate-opening are preserved constant. If the head is constant and the gate-opening fixed at a certain value, and the load on the water wheel is changed, there will be a change of speed. Conversely, if the load be preserved constant and the same head and same gate-opening be preserved, there would be no change in speed.

Q. 195. Let us assume that there be variation in

these respects as between gate-opening and head, on the one hand, and load on the other. May there then be differences or disproportions as between speed and load?

A. In order to make the conditions general, the quantity of working fluid multiplied by the unit energy in the working fluid, must be equal to the energy supplied to the load, and any change in either the quantity of working fluid or the energy per unit of working fluid for a given load, will produce a change in speed. In fact, any change in any one of the three factors will produce a speed change. Therefore, if the load be constant, the gate-opening constant, and a change in head takes place, the speed will change. If the head be constant, the load be constant, and the gate-opening be changed, the speed will be changed. If the head and gate-opening be constant and the load be changed, there will be change in speed. But unless some one of these three elements be changed, there will be no change in speed.

Q. 196. Let us assume that the load increases and the head proportionately increases, and the gate-opening remains constant. What will be the result upon the speed factor?

A. There will then be no change in speed. In every case the relationship comes back to the quantity of working fluid multiplied by the energy per unit volume as being equal to the energy delivered to the load. If two of the opposing factors are changed, and changed proportionately, the third being constant, there will be no change in speed.

Q. 197. Now, let it be assumed that under the conditions last recited, the water wheel in question

is governed by a device responsive to change of load. Would or would not a governing action occur when the load was increased and the head proportionately increased?

A. If the governing device be responsive strictly to changes in load, the water-wheel gate would be moved to a new position for every load change, regardless of whether or not there had been any change in any of the other factors. And, no matter how much the head might increase or decrease, or however much change of head might keep pace with the change of load, the governor would always move the gates whenever a change in load would occur if it be actuated by a device responsive to changes in load.

Q. 198. And such change of gate position responsive to such governor, in turn responsive to variations in load, would produce a change in speed of the water wheel. Is that correct?

A. If the head should remain constant and the governor be a well-designed machine, there would not be a substantial change in speed any more than with any other governor. But if there were a variation in head and the controller were responsive strictly to change in load, then there would be a gate movement for change in load, even though there had been a compensating condition of change in head, which means that a governor built on these lines would have a different speed for every difference in head.

Q. 199. And what would be the results in these respects as to maintaining proper speed of the wheel?

A. It could not maintain proper speed of the wheel unless newly adjusted for every change in head, and it furthermore would have the added disadvantage of a change in relationship of parts for change in load, which, carried to its last analysis, means a change in the velocity of the device which is driven by the water wheel, whether a line-shaft or a dynamo, through a portion of one cycle of revolution. This is a condition which could not be permitted in the driving of alternating current generators, nor driving the machinery of that class which depends for uniformity on the successful production of the commodity being manufactured, such as textile machinery.

Q. 200. Now, let us assume the provision of a governor designed to be responsive to changes in both speed and load, and assume that the controlling portion of this governor element is directly installed between the water wheel and the driven machinery, as an electrical generator, what would be the nature of the controlling action of this device with respect to the speed of the driven machinery where load increases and head increases at the same moment, the gate opening being constant?

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Q. 201. By Mr. Blakeslee: And where the power-consumer driven by the water wheel is an electric generator, what would be the effect upon the potential of the current generated?

A. In case of constant generator excitation, or for a self-excited generator, the potential would increase with speed increase.

Q. 202. And what would be the result upon the speed operation of an electrical energy consumer supplied by such circuit?

A. Under normal conditions of electrical distribution such an electrical-energy-using device would absorb more electrical energy than it had been receiving prior to the increase in voltage.

Q. 203. And were a governor possible for the machinery being driven upon this circuit, what would be the effect produced upon its rate of action?

A. An increase in speed, whether alternating current or direct current, except in the one case of under-saturated direct current motors. In these the application of an increased potential to the armature brushes and an increased potential to the field winding, within certain limits, would result simply in maintenance of constant speed. But these latter kinds of machines are so unusual that it may be stated that, in general, the speed of any electric motor will be increased.

Q. 204. And how with respect to the intensity of illumination of electric lamps installed on such circuit?

A. If your inquiry refers to incandescent lamps, the incandescent lamp is the most sensitive electrical device to voltage changes of which we have any knowledge in the art. It has been stated by certain authorities, after numerous photometer tests, that a carbon filament incandescent lamp will vary in its intensity of illumination directly as the fifth power of the voltage. Very small voltage fluctuations at

the terminals of the carbon filament incandescent lamp will produce very marked changes in the intensity of illumination. In metallic filament lamps, the ratio of change, while not so great as with carbon-filament lamps, does vary in accordance with some power of the third or fourth degree, so that in this case, although the brilliancy of these lamps does not undergo so rapid a change as that of carbon-filament lamps, the change in illumination is considerable for small changes in voltage applied to them.

Q. 205. And where the generator of that type is excited by a separate exciter driven by or from the same shaft as the generator, would or would not this change in voltage take place, corresponding to a change in speed of the water wheel

A. The change in voltage under these conditions would be much greater than the change of voltage in self-excited generators, because the change in voltage of the exciter will be more rapid than the change in its speed. Therefore, not only will the main generators be operated at a higher speed than normal, but the density of the magnetic field would also be increased, so that the voltage changes would be of much greater degree than the speed changes which caused them, until the limits of saturation of the magnetic parts of the exciting and main dynamos were reached.

Q. 206. And how if the exciting dynamos were separately or independently driven?

A. If they were independently driven, then the

change in voltage of the main generator would be directly proportional to the change in speed.

Q. 207. So that under any of these circumstances there would be an increase in voltage producing an increase of speed of the mechanism driven on the circuit, or an increase of luminosity of the electric lamps upon an increase of speed. Is that correct?

A. Yes; that is true. And, further, the speed of all synchronous machinery which is not dependent on voltage for its speed, would be increased, due to the increase in frequency of the main generators in case of alternating current systems.

Q. 208. And now assuming a converse of these conditions, a decrease of load simultaneously with a decrease of head, and a maintenance of constant gate-opening, would the converse be true in the several particulars treated of, so that a decrease of potential in the electric circuit of the generator would ensue and a decrease of speed of driven mechanism, diminishment of luminosity of lamps, on the circuit occur?

A. Yes; the converse of the previously described conditions would take place.

Q. 209. In a plant so organized, that is, with a governor of this type, having an element responsive to both speed and load changes, and in which such changes of load synchronously with changes of head could occur, what would be the nature of the governing performance with respect to the requirements of a governor in a modern hydro-electric power plant?

A. It would be inoperative, for the reason that

the governor-controlling device could take different positions of equilibrium which would correspond to different speeds, and no governor could successfully control any water wheel unless the equilibrium of the controlling system were disturbed whenever the speed departed from any predetermined speed.

Q. 210. Returning now again briefly to this question of the returning action which you discussed this morning as being secondary action effecting the operation of the speed-sensitive governor, such as that disclosed in the patent in suit, is this returning action a voluntarily controlled action, or an action which is automatically responsive to the conditions set up in governing?

A. It is automatically responsive to the conditions set up in governing. , ,

Q. 211. And what have you to say as to the occurrence of this automatic returning action to prevent overrunning, or the movement of the water-wheel gate to an improper position consequent upon a disturbance of speed, with regard to the varying degrees of speed changes which the governor is called upon to correct?

A. I have previously explained the operation of this device, in which I pointed out that under ordinary conditions of a sufficient change in load to demand an appreciable gate movement, that the automatic returning device would move through the maximum distance that it is able to move, and in doing this it would compress the spring which imposes the additional external force on the governing sys-

tem. At the instant of beginning of governing, the pressure on this spring would be zero, and the pressure would continuously rise until the maximum pressure would be reached. After the maximum pressure is reached, if governing continue, the pressure then exerted to return the controlling device to its normal position would remain constant throughout that portion of the time of operation elapsing from the time that the spring is compressed to the maximum degree until the controlling device returns to its normal position. After the return of this controlling device to its normal position, the returning device is released and thrown immediately back into its normal position, and in this latter position exercises no influence on the controlling device. At this moment, however, there still exists an unbalanced force acting on the controlling device, for the reason that the controlling device has been forcibly returned to its normal position, thereby being brought back to its normal before the unbalanced forces themselves have been brought to equilibrium by the return of the water wheel to its normal speed. Due to the existence of this unbalanced force the controller will again operate and the gate again be moved. But this second time, assuming proper design and adjustment of the governor, the gate movement and the length of time that the machine should operate, would be very small and possibly a third, and, it might be, a fourth movement would be required to bring the gate to its final position. The statement that the gate moves a long distance and

nearly reaches its final point and then in a succession of small hitches or movements, step by step, each step being smaller than the preceding one, finally is brought to its normal position to correspond with the change in load, would probably best describe the action of the mechanism. In the case of the long step, or first movement, the return pressure exerted by the returning device would be in the main a constant pressure, because the period of time required for the long movement would be sufficiently great to enable the returning device to rotate through its maximum distance of movement and bring the spring which tends to restore equilibrium of the controlling device to its maximum pressure and hold it constant during the rest of the time that the governor would operate. During the second interval it is probable that this same condition would also be reached, but the duration of time from the point where the spring of the returning device had reached its maximum pressure and the return of the governor-controlling device to its normal, would be practically infinitesimally small. This is clear from the fact that the maximum force of the returning device has already proven itself to be stronger than the existing unbalanced forces by returning the controller to its normal position when the first step of gate-movement took place. Therefore, in the second or any succeeding step of gate-movement, it is obvious that the pressure exerted by the returning device to restore the controller to normal can never reach its maximum value, but must operate at some interme-

diate value. That is to say, the returning device friction disc cannot operate through the entire extent of its movement or throw, because prior to its reaching its maximum degree of movement the pressure caused by the returning spring will have overcome the unbalanced forces acting on the controlling device to return it to its normal position. Therefore, in the second step, the movement of the gate would be small, and the force set up by the returning device to return the controller to its normal position would be less than the maximum. Also, if a third step in the movement of the gate were made, the duration of movement of the machine would be less than for the second step, and the pressure set up by the spring of the returning device would also be less than the pressure which it previously set up for the second step. It is well known in the art that when rotating machinery departs from any fixed speed, the curve of relationship between time and speed is a parabola. The equation of this parabola, of course, depends on the relation between the mass which ~~N~~ is rotating and the forces which tend to change the velocity of rotation. This law is also obviously true for the return of a rotating mass from some speed below normal back to normal speed, that the curve of relation between the time and speed will be a parabola. In order that the governor of any prime mover may be a successfully operating machine, it is necessary that the impulses or forces which are brought into action as governing proceeds should be proportioned in some manner to meet the conditions

of speed, stored energy in the rotating mass, and all the forces acting in accordance with a parabolic curve.

Q. 212. A parabolic curve, then, expresses graphically the curve which will be followed by this rate of returning action?

A. Yes. The returning device should be of such character that the impulses given by the governor to open gates should correspond in degree for different intervals of time with a parabolic curve of which the ordinates would be represented by time and the intensity of the unbalanced forces impressed on the water wheel and rotating masses to accelerate or decelerate the velocity and bring it to some predetermined speed value.

Q. 213. Now, assuming that the level of the mercury in the make-and-break contact device shown in the patent in suit at "45-45a" were so that the circuit would be broken at that point before it were broken at either contact device "40-40a" or "41-41a", so that consequently after an initial effort the returning device would be thrown out of operation prior to one or more attacks by it upon the controller and the armature "34" of the solenoid "33" thereof, might not the consequent intermittent action of the returning device take place until a certain near termination point in such general governing action was reached?

Mr. Westall: Objected to as calling for a matter of surmise and conjecture concerning an arbitrary construction of a mechanical device not in any way

within the issues of this case, the patent showing clearly that no such construction is covered.

A. If the level of the mercury in cup "45" or the adjustment of the contact point "45a" be such that the circuit made by this contact is opened prior to the opening of either of the main circuit contacts, the result would be that the friction returning device would begin to return the controller to equilibrium and, after a short distance of motion of the controller, the compression between the discs of the friction returning device would be removed by opening the circuit of the electro-magnet which produces this friction, the returning device would then act no longer, the still unbalanced forces acting on the controller would cause a return of the controller to its unbalanced position where contacts "45" and "45a" would again be closed and the external elastic force of the returning device would again be reapplied, and it is probable that an adjustment could be reached whereby the water-wheel governor would act continuously from the beginning of gate movement until the end of gate movement, and the oscillation of parts taking place within the limits of making and breaking of the contacts "45" and "45a", and the friction removal and re-application through a recurring series of cycles of the force from the returning device acting to restore the controlling device to its normal position.

Q. 214. By Mr. Blakeslee: I now show you 'Defendant's Exhibit Berry Blueprint No. 1,' and 'Defendant's Exhibit M Z,' 'Defendant's Exhibit

XX," and "Defendant's Exhibit ZZ," and "Defendant's Exhibit Cobb Blueprint No. 1," and "Defendant's Exhibit Interior of Power Development Company's Power House," and ask you if you have examined the same?

A. I have seen these before, but never examined them carefully.

Q. 215. I call your attention more particularly to the features shown in Fig. 1 of "Berry Blueprint No. 1," to the part generally designated "B" in "Defendant's Exhibit Interior of Power Development Company's Power House," and to the part marked "B" in "Defendant's Exhibit ZZ," and to "Defendant's Exhibit M Z," and ask you if you understand what this grouping of parts purports to be?

A. I understand that these parts form a species of dynamometer device with centrifugal weights arranged within a fly-wheel, which weights are so arranged on levers that they tend to exert a force opposing the force set up by the dynamometer action, and also the arrangements comprises two tension springs which tend to assist the force set up by the dynamometer action. This is the understanding of the device which I gather from the drawings and prints of the exhibits mentioned.

Q. 216. Now, assuming, with reference to "Defendant's Exhibit M Z," that the part "B" is fast on the water-wheel shaft, and the annulus "M" is fixedly connected with the generator shaft, how will the rotation of the water-wheel shaft be transmitted to the generator?

A. In the drawing shown in the above-named exhibit the direction of rotation is counter-clockwise. Under these conditions the torque set up by the water-wheel shaft and transmitted through the diamond-shaped piece "B" will be transmitted to the generator, which is driven through the links "D", "D' ". The tension on these two links acts to pull the weights inward towards the center of the shaft. The centrifugal force of the weights which tends to cause them to move outwardly from the center of the shaft is apparently the force which balances the torque, and, in addition, the tension of the springs "S", and "S' ", thereby causing a transmission of power from the diamond-shaped piece "B" fastened on shaft "A" to the annular piece "M" fastened to the generator which is driven by the water wheel.

Q. 217. Assuming now that the water-wheel gates are controlled by connections between the arms "E", "E' ", carrying the weights, and such water-wheel gates, what general characterization would you give to this governor element as expressing the type of governor including the same?

A. I would call it a mixed-load-and-speed governor.

Q. 218. And with the use of such governor will or will not your previous testimony apply, wherein it is related to the use of a combined speed-sensitive and load-sensitive governor directly interposed between the water-wheel shaft and the generator shaft under the varying conditions treated of by you in such previous testimony?

A. Yes; the conditions and design regarding such device will apply to the one shown in "Defendant's Exhibit M Z," provided that my understanding of its operation is as I have outlined.

Q. 219. And how will this governor compare with the governor of the patent in suit with particular reference to the speed-sensitive element thereof, being the dynamo "8" of the patent drawing, "Complainant's Exhibit A?"

A. I cannot relate the two different arrangements at all. The speed-sensitive device of the patent in suit is subject to change only for change in speed, which change in speed is the secondary result of a change in load. The speed-sensitive device of the patent in suit will act to correct the speed of the water-wheel when it departs from its normal value, regardless of any surrounding conditions which may have changed the speed, whether these be due to change in head, change in load, or to any other cause. The governing device as depicted in drawing "Defendant's Exhibit M Z," would have some definite relation of its parts for a given load and a given speed. Any change in either of these conditions would produce a change in relation of the parts, and, therefore, produce motion of the water-wheel gates. This means that if the load were reduced, the speed increased; and then the load again thrown on before the increased speed had been compensated for, the weights "F", "F' ", would take a position farther from the center of the shaft and there be counter-balanced by the increased load. That is, a

he new position of equilibrium would be found, although the speed would have been increased. There may be several positions of equilibrium between speed and load, and a different speed for each one of these positions. Because of this characteristic, I would consider any device built in accordance with the drawing before me would be inoperative to maintain a constant speed. Furthermore, it would have a distinct disadvantage in that the angular relation between the driving shaft of the water-wheel and the driven shaft of the generator would be changed for changes in load, and this change would naturally be suddenly made, which means that there would be a sudden change in the angular velocity of the generator driven by the water wheel, lasting, of course, but a fraction of a second and extending through probably only a few degrees, but sufficient to cause electrical disturbances in the action of alternating current generators that might under certain conditions set up serious oscillatory disturbances over long distance transmission lines, particularly if these lines supply current to synchronous machinery.

Q. 220. Would a device organized like that depicted in "Defendant's Exhibit M Z," and applied between the water-wheel shaft and the generator shaft so that the torque of the former would be applied through it to the latter, and the water-wheel gate attempted to be controlled through the instrumentalities affected in position by such transmission, be a speed-sensitive governor device such, in kind, or possible performance, as that disclosed in the

patent in suit, and dependent particularly upon the action of the generator "8"?

A. No; it could not, for the reasons which I have already given.

Q. 221. Assuming now that the Examiner has not broken "Exhibit W," I now show you "Complainant's Exhibit W,"—it has traveled about 4,000 miles already—and ask you if you are familiar with this type of device, or this construction of device, assuming that its operation were as mechanically intended and not interfered with by the present fracture in the part No. 2974, and that that piece was continuous and unbroken.

A. Yes; I am familiar with it.

Q. 222. In practice, what is contained in the dashpot cylinder in this device?

A. There is a piston which normally has a small hole through it, and, in addition, there is at the upper part of this cylinder and within the rectangular brass box that is placed on top of the cylinder, two holes, one at each end of the cylinder, so that when the piston moves backward and forward, the oil which is placed within the cylinder is free to exude from one hole and be drawn in at the other. One of these holes has a stem passing into it the end of which is conical, and this stem may be adjusted so that the area of opening of the hole is greater or less as may be desired. The stem is attached on the outside of the cover to a projecting piece which is fastened to the upper end of the stud, this stud passing downward through the cylindrically shaped

piece arranged to receive it, and fastened at the end of the brass box above the cylinder and projecting toward the governing mechanism. This stud is provided with a spring which normally holds the conical-ended stud down into the hole at the end of the cylinder.

Q. 223. Have you ever personally used, attended to and adjusted such a device?

A. Yes; I have just finished the installation and adjustment of three governors having this identical device on them.

Q. 224. What is the name of the governor including this device, as known in the market?

A. Known as the Lombard governor.

Q. 225. That is the same Lombard governor you have referred to before as being made by the Lombard Governor Company of Ashland, Massachusetts?

A. It is.

Q. 226. Have you ever seen a governor of this type from which was omitted the V-shaped part upon the broken piece numbered "2974" and also the piece numbered "2975", and the adjustable connection working in this V-shaped piece, and opposed by the spring action, and the valve thus automatically adjusted in the action of the device?

A. I have never seen a Lombard governor without those.

Q. 227. If these parts last enumerated are not utilized, or if they were omitted from this Lombard

governor, what variation in the operative effect of the governor would ensue?

A. If all the parts of the governor were present except these parts which you have mentioned, the governor could not cause the main operating mechanism to apply force to move the gates in accordance either with the theoretical parabolic curve of return from a higher or lower speed to normal speed, nor even with a succession of points which would be substantially tangents to such a parabolic curve. Or, to express it physically, the tendency of the returning device of the Lombard governor would be to apply a constant force to return the controlling mechanism to its original normal position, which would so continue constant throughout the time of governing and regardless of the distance through which the governing mechanism had moved, or whether the movement were made in one step or in a series of successive steps.

Q. 228. And in what respect does the use of these parts last enumerated induce a variable tendency in the respect you have mentioned?

A. The action of the speed-sensitive device is attended by a movement of the piston in the dashpot, which, in turn, tends to move the dashpot, and were it not for the before-mentioned holes in the piston and dashpot the dashpot would move exactly with and as far as the piston. The holes in the dashpot allow the piston to move further than the dashpot itself, because some of the oil in it escapes through the holes, thereby providing for a certain

the amount of free travel of the piston. It follows from this that the pressure transmitted and received from the piston, will depend on the area of opening of holes in the dashpot. The parts which you have inquired about are so arranged that as the piston presses the dashpot forward or backward, the stud which I have previously mentioned and which is held downward by a spring is caused to ride on an inclined plane made by the V-shaped section of the piece numbered "2974", and in so doing it lifts the stud, and, with it, lifts the other stud which is connected with the first-named stud, the latter having a conical-shaped end which fits in the hole at that end of the dashpot. From this it follows that as motion of this returning-device proceeds, the pressure which it applies to cause a return of the parts of the controller to their normal position, greatly diminishes, so that the diminution in the pressure to the returning, approximately keeps pace with the diminution in the unbalancing of the forces in the controlling mechanism, which latter diminution is caused by a gradual return of the water wheel towards its normal speed.

Q. 229. And what results, with respect to movement and cessation of movement of the water-wheel gate, with relation to its proper position to govern the wheel in response to change conditions which have caused the variation of water-wheel speed?

A. This device acts to return the controlling mechanism to its normal position when it has become displaced, due to a change in the speed of the water

wheel, and to provide an external auxiliary force to assist in bringing the controlling mechanism back to its normal position before the speed of the water wheel has reached its normal value, and to thereby prevent overrunning or "hunting" of the water-wheel gates; and by the proper adjustment of this mechanism the governor can be prevented from moving the gates past their proper position whenever change in load occurs.

Q. 230. How about change in speed?

A. I use the terms "change in load" and "change in speed" to convey the same idea. Change in load causes change in speed, and, therefore, when I use the term "change in load", it is meant to convey the idea that change in speed follows.

Q. 231. And that is predicted upon the assumption that you are using a speed-sensitive device in this controller. Is that so?

A. Yes.

Q. 232. And that is in distinction to a purely load-sensitive or load-sensitive and speed-sensitive device in the governor, is it?

A. Yes, provided I understand by the last portion of your question that the load-sensitive and speed-sensitive device comprises one device in which the parts subject to change in position due to either load or speed are inter-related.

Q. 233. That is what I intended to imply. A unitary organization, in other words. If the parts last enumerated are omitted from this Lombard governor device, what will be the difference of action of

the governor with respect to bringing the water gate into proper position in accordance with the new position, causing change of speed of the water wheel, and holding the gate in that position to prevent overrunning?

A. Unless the gate motion be made to take place very slowly, that is to say, at such a rate that the acceleration or deceleration of the rotating parts will have time to ^{take} place while the governor is moving from one position to the other, the gates would be moved past the proper position, and the governor would "hunt"; that is, move the gates recurrently, past the proper position for the new load, going first too far in one direction and then back again too far in the ^{other} direction; and while a very slow moving governor might be made to operate the gates successfully, the time element of such a governor would, for most conditions in modern electric stations, be too slow to give satisfactory regulation.

Q. 234. Have you had experience with governors in which such elements as those last recited in connection with discussing "Complainant's Exhibit W," or similar elements for obtaining like results, were absent, or, if present, were improperly adjusted?

A. I have had experience in two cases. One that I recall dates back some fifteen or sixteen years, in which the governor allowed the generator speed in the water-driven electric railway plant to vary at least twenty per cent from normal in either direction. And I have just recently, that is, during the present

year, had experience with governors identical with the governors from which these parts of Complainant's Exhibit "W" were taken, where the parts were not properly adjusted, and with a change in load on the generators the speed would change going past the normal in first one direction and then the other, and continuously "hunting" until arrested by manually handling certain parts of the governor.

Q. 235. And in both these cases what were the results with respect to supplying properly stable electrico-motive force to the street railway motors and applying properly constant potential energy to incandescent lamps and other current consumers, upon the circuit in the second case?

A. We got an extremely bad condition of load in the case of the railway plant, because the station was located some six miles from the center of distribution, and although the generators were compounded for a ten per cent increase in voltage as between full load would actually cause a reduction in voltage of some ten or twelve per cent, due to decrease in speed, so that the electrical condition was that of a greatly increased current transmitted through a circuit with a reduced electro-motive force at the generator terminals. This, of course, resulted in a very great decrease of voltage across the motor terminals, with the result that motors were frequently burned out, it being well known in the art that this result often comes after marked voltage reduction. In the case of the last-named plant, I have been attempting to get the parties who are to take over the plant when fin-

ished, to receive current from the generators and begin operation of the plant so that acceptance might be obtained, and the behavior of the governors up to about three weeks ago was such that the people in authority declined to turn current on to their circuits from this plant, owing to the wide variation in speed, and, consequently, in voltage and frequency. This condition has since been corrected by proper adjustment, but it endured for four or five weeks before it was corrected.

Q. 236. You mean the adjustment of the automatic features in this variable returning action in the Lombard governor which you have just recently discussed?

A. Yes; it was the adjustment of these specific parts as shown in this "Complainant's Exhibit W," together with the co-acting portions operated by the short section of rack shown on the sliding block of this exhibit.

Q. 237. And prior to obtaining the proper adjustment of these parts did you attempt to energize incandescent lamps by energy from this plant?

A. No; we were not permitted to turn current on to the lamp circuits. We, however, did supply current to some motors driving pumps, one of which was a 500-horse-power induction motor and the other was a 350-horse-power synchronous motor, and the speed variations of these motors were so great that it caused the decision of the parties in authority not to permit current to be turned on to the general ser-

vice distribution system until the governing was more uniform and stable.

Q. 238. And had lamps been energized by the current from that plant at that time what would have been the illuminating constancy?

A. The intensity of illumination would have varied greatly and would have been unsatisfactory; and, in addition, the overvoltage effect would probably have burned out a large number of lamps.

Q. 239. And when a trolley car or electrical-motor-driven car suffers a burning-out of its driving motors when in service, what happens to the car and the passengers on it?

A. If only one motor is burned out, usually the car can be worked back to the car barn and repairs made, and this is usually the case. Seldom are both motors burned out. Of course, in the latter case the car would have to be towed back to the barn. Of course, in this latter case the passengers would have to get out of the car and take some other means of conveyance.

Q. 240. And as to such motor burnings and lamp destruction and interruption of industrial service due to such voltage variations, do these things run into money or are they merely negligible in operation in industrial and domestic and transportation service?

A. They obviously have considerable financial value, where power is supplied to textile mills, for instance, the threads in the spinning frames may become broken, and frequently are, with sudden

changes in speed, and the uniformity of speed is an absolute necessity for a uniform product, and to prevent shutting-down different spinning frames to re-start the threads. Also, in supplying power to paper manufacturers where Foudrinier paper machines are used, any slight increase of speed, if sudden, will tear loose the paper, and then it requires a consistent period of time to start the paper back through all the machinery and heating rolls and onto the winding rolls, so that the question of speed change in industrial plants and in illumination, becomes an important factor.

Q. 241. What does it cost to rewind and rehabilitate a motor of the type used in running a street car when it is burned out, as you have mentioned?

A. It depends on many factors and the degree of destruction. Also, in case of a small railway plant with a limited quantity of rolling stock, it may be a matter of considerably greater loss than that represented by the cost of rewinding the burned portions of the motor, because it may take one of the important pieces of rolling stock out of service at a time when it is greatly needed. But to carry the car into the barn and dismantle the motor and then re-assemble it, costs not less than \$20 to \$40, depending on the arrangements made, and then the cost of winding may in itself be trivial—sometimes not over \$6 to \$8, although there are other times when it may run several times this amount.

Q. 242. And such car may be thrown out of service for a number of days?

A. Hardly for a number of days, but certainly for not less than twenty-four hours, I should say, under ordinary and usual conditions.

Q. 243. And that results in tying up an investment proportionate to the cost of the car and the percentage of overhead expense attaching to the maintenance and operation?

A. That is true. In companies with a large system that is negligible. In companies with a small system, where there is but little rolling stock and one car forms a considerable percentage of the total, it becomes a serious matter.

Q. 244. What have you to say with respect to the action of the Lombard governor as part of the controlling system of a hydro-electric plant, including the features present in "Complainant's Exhibit W," as to its action in causing the water-wheel gate to come to its new position and stay there, in comparison with the action of the returning-device disclosed in the patent in suit "Complainant's Exhibit A," and including the several features thereof which we have previously discussed, namely the clutch parts "22" and "23", the rod "25", "25a", the electro-magnet "32", the springs "28" and "29", and the several connections for energizing the electro-magnets, etc.?

A. The function and the ultimate results obtained are the same in both these returning devices. In one there is the elastic pressure acting pressure acting on the controlling mechanism; in the other there is the pressure produced by compression of a

gradually diminishing volume of oil, which is opposed by an elastic spring pressure. In the case of the patent in suit, after the water-wheel gate has been moved through a certain distance, that is, the first step in governing taken which has been described, a series of very short, gradually diminishing, successive steps are taken, in each of which the pressure brought to return the controlling mechanism to its normal position takes place. In the Lombard governor the continued motion of the compensating mechanism produces a continually diminishing pressure in the dashpot, and, therefore, a continued reduction in pressure acting against the spring of the compensating mechanism, this latter effect being due to the gradual ^{upward} movement of the stud having the conical point that fits into the relief hole at one end of the dashpot, as has previously been described.

Q. 245. And may the returning actions of both these returning devices be expressed graphically by a parabolic curve such as you have mentioned?

A. I would say that the action of these returning devices is such as to cause the governor action to be such that it would follow the parabolic curve of return of the rotating parts from an erroneous speed back to normal.

Q. 246. That is, the ultimate effect upon the speed of the water wheel to restore it to normal, consequent upon the action of these two returning devices, may be expressed graphically by such parabolic curve?

A. Yes.

Q. 247. Referring now to "Complainant's Exhibit A," the patent in suit, I will ask you why within your conception of the invention and the disclosure of your invention as entering into your sworn application for the patent in suit, turnbuckles were provided as shown in Fig. 5, in both courses of the rope or cable extending to the lever "50," actuating the butterfly by-pass valve, if these be turnbuckles, and if I am not correct in assuming they are, please so state.

A. These are turnbuckles. They were placed in both of the rope cables which lead to the by-pass valve lever for the purpose of adjusting the by-pass valve and pulling up the ropes tightly thereafter to prevent any slackness in them or any lost motion which would accompany such slackness.

Q. 248. And tightening up one of these turnbuckles and loosening up the other one with the by-pass in any initial position, would produce what effect with respect to such by pass valve position?

A. It would change the normal position of the by-pass valve at which it would have to come to rest when governing was completed.

Q. 249. What, then, was your conception of the normal position of the by-pass valve disclosed in this patent?

Mr. Westall: The question is objected to on the ground that the witness's conception is not material here, nor his intention in providing any mechanical means or parts, unless that intention or conception is expressed in the patent in some manner, or unless

some indication is contained in the specifications that such device is to have some such use.

A. My intention at the time that this invention was made, and as expressed to the attorneys who acted for me in securing this patent No. 695220, was that when conditions were such that it was desirable to have the auxiliary by-pass valve operate in both directions, and when a sufficient supply of water would be available to permit continuous waste which would proceed from maintaining it partly open as its normal position, that its normal position would then be half-open and half-closed, and motion of the water-wheel gate in either direction would be attended by a corresponding inverse motion of the by-pass gate in either direction. But whenever the water supply should become diminished below a quantity which would provide a considerable excess of water above the amount needed for power purposes, the by-pass valve would be adjusted so that its normal position would be completely closed, and it would then operate in only one direction, namely, to open whenever the water-wheel gate should close. In this way the governing would be better than that obtained without any by-pass valve at all, and no excessive pressure due to a rapid change in the total amount of gate opening at the end of the penstock could be produced. At the same time, the continual loss of water would not take place, and there would be only a small loss at times of governing, and whenever the direction of water-wheel gate motion was toward closing. In this way a better degree of governing and

a factor of safety against rupture of penstock would be provided, without any appreciable loss of water, so that in this way and adjusted in this manner the by-pass valve could be operated even under conditions of drought and inadequate water supply for power purposes.

Mar. 9, 1915 A. M.

Q. 250. You have testified to having recently installed, operated and adjusted three Lombard governors, including features of construction identical with those of "Complainant's Exhibit W," and also have testified to having just finished the work of construction of a hydro-electric plant at Austin, Texas, in which are installed Lombard oil-pressure-actuated governors. Is there any connection between these two installations of Lombard governors?

A. They are identical.

Q. 251. I again call your attention to "Defendant's Exhibit Cobb Blueprint No. 1," and to "Defendant's Exhibit Berry Blueprint No. 1," and more particularly to those features operated from the alleged governor device which you described yesterday in connection with the plant concerned, and being the valve mechanism purported to control the position of the water-wheel gates, and the alleged by-pass device, being principally the part shown at "O", "P" and "N" in the first-mentioned exhibit, and the parts numbered "22", "23", "24", "25", "27", "28" and "21", in the last-mentioned exhibit, together

with the internal piston, valves and the like, necessary to render such a think in any sense operative, and I will ask you if you have a general understanding of the apparently intended mode of operation of these features. In this connection you may pick out either group of elements you wish, upon the assumption that the general construction and mode of operation represented is the same in each instance.

Mr. Westall: Let the record show that the witness has stated that he did not understand the device thoroughly, and that he had not heretofore examined it, and that he is not sure that he understands the operation of the device, and that he has spent five minutes endeavoring to figure out how the device operated.

Mr. Blakeslee: We will qualify the last question first by admitting that the blueprint appears to be a poor piece of work and difficult for any engineer accustomed to good mechanical drawings to follow, and that it does not apparently show some of the things testified about by defendant's witnesses. However, we will continue in qualification of the last question, by basing the same upon the assumption that with reference to "Defendant's Exhibit Berry Blueprint No. 1," the part "24" is a slide valve controlling admission of pressure fluid to the cylinder "25" to oppositely actuate piston "26" therein, which is provided with the piston rod "27" and connected at "28" with the floating lever "21", which, in turn, is connected at "20" with the bell-crank "19", actuated by the attempted governor device. The

slide valve also controls outlet by-pass, the service pipes of which are shown at the ends of the valve casing, controlled by said slide valve and permitting escape of fluid from the ends of the casing. And let it now be further assumed that the piston rod "27" connects with the controls of the attempted by-pass device and the water-wheel gate valves.

Mr. Westall: Counsel for defendant objects to the leading nature of the question, and to counsel for plaintiff testifying in the manner he has, but is willing to permit the question to stand, simply for the purpose of showing how thoroughly and easily the drawing is understandable, even by one unskilled in the art who has given the subject any attention whatever.

Mr. Blakeslee: Counsel will not attempt to qualify himself, as he is not about to testify nor has he testified. I believe such qualification would be superfluous, as we will leave the court to judge by his examination of this witness. However, the question is based now upon the presumption, and that is as far as we are concerned with the question, and if the question is answered on that presumption it will satisfy us in all respects.

A. With this explanation of what the lines in the drawing are really intended to depict, I now understand the relation of the parts and how they would operate in an actual mechanism.

Q. 252. Now, with that understanding, and with the parts connected as assumed with the attempted governor device, or any governor device,

and also with controlling means for the attempted by-pass device, and water-wheel gate valves or any like valves or gates, please state what the operation of the parts specified would be.

Mr. Westall: Objection is made that the record clearly shows that the witness is not qualified by a previous study of the device to state with any degree of positiveness what the operation of the device would be, and that, therefore, any conclusions that he may express would be in the nature of mere guesses or surmises influenced by his position or by his being called as a witness on behalf of complainant, and by his interest in the case as the patentee.

Mr. Blakeslee: The witness has had placed before him the statement, that is, a hypothetical statement of facts, and we contend he is sufficiently qualified to discuss such facts and to state the result of operation of the parts mentioned, and we do not call for a conclusion, but for a statement of facts based upon such hypothetical construction supported by what the witness as a skilled engineer may find in the drawings themselves.

Mr. Westall: Objection is also made that the hypothetical question is fragmentary and not so complete as to bring it within the issues of the case and make any answer that might be based thereon of any value in determining any of the issues of the case.

A. In case the load should change, there would be a movement of the arms of the governor wheel due to change in the torque transmitted from the

water-wheel shaft to the driven shaft, which, in turn, would move link rod "17" and the bell-crank "19". The piston rod "27", being stationary at that moment, the pivotal point of floating lever "21" would for that instant be fixed, as it is fastened to the piston rod. If the movement were such that lever "17" were moved toward the left, the piston valve "24" would be moved upward. This would admit whatever fluid pressure might be used to operate the machine to the upper end of the piston and motion of the piston rod would begin, and this motion communicated to the water-wheel gates would cause their movement toward the new position corresponding with the change in load. When the arms in the governor wheel have moved to their new position, due to the change in load, moving with them the piston valve, as before described, and these governor arms become fixed in their new position, then the link "17" and bell-crank "19" are also fixed, and the floating lever "21" now has a fixed pivotal point at its upper end, while the lower end at "28" on the piston rod, which at the beginning was a fixed pivotal point, is now a moving or operative point, the motion of the piston taking place now taking place in a downward direction. This downward movement of the piston also produces a downward movement of the piston valve, which valve had previously been moved upward. So that in the action of governing the piston rod which moves the wheel gates also acts to move the controlling valve back to its neutral position. When the piston has moved a suf-

ficient distance to have brought the valve back to its neutral position, motion would stop. If governing were uncompleted, assuming now that the speed and load control mechanism were operative, the piston valve would again be moved in the same direction as before, causing a motion of the main operating piston in the same direction as before, which motion would continue until the controlling valve is again brought to its neutral position, and in this way governing would proceed. It might be that by appropriate design and adjustments that not over two steps would be required, or two consecutive movements, although it might be possible that three or four steps, each being shorter than before, would result. All this, however, is based on the assumption that the controlling mechanism is operative.

Q. 253. By Mr. Blakeslee: Do you find in this construction of parts an inter-relation of features, or do you not find such an organization, as will cause the piston valve "24" to be returned to its normal position and held there during a returning action of the governor element in the fly-wheel, including the centrifugal arms and weights, while the wheel is re-assuming its ultimate correct speed?

A. In view of the character of the controlling mechanism, the specific action of the actuating piston and the controlling piston valve cannot be definitely determined without an assumption as to what takes place in the controlling device itself, the drawing of which is marked "Fig. 1" in "Defendant's Exhibit Berry Blueprint No. 1". Some assumption has to

be made as to the action of this device, because it is not a suitable operating mechanism and for the same conditions of load may operate at different speeds. If it were strictly a load-governor, then the position of the arms in the fly-wheel and carrying the weights "3", "3" would be fixed for any specific load, provided the speed were constant. That is, there would be some definite position of the arms to correspond with any definite load, and the position of the arms would change, therefore, for change in load. In this case the gate-moving mechanism should be made to respond so that the movement of this mechanism would be exactly proportional to the movement of the gate arms. The gate-moving device for piston and controlling valve seems adapted to perform this very function. The link "17" will move the bell-crank "19" and with it the controlling valve through a distance proportional to the change in position of the governor arms. This being the case, piston "26" will have to move through a distance which is proportional to the displacement of the valve "24", and by a proper adjustment this device could be so made that for each displacement of the arms there would be a corresponding motion of the piston "26" and of the gate rigging, which controlling valve is brought to its neutral position, and operation ceases. There is, however, another element introduced, which is that the governor is apparently responsive to speed changes; and since, as I have before pointed out, it is impossible to combine in one element these two functions of load and speed

change, it is impossible to say what the exact performance of this machine would be, unless all the other attending conditions are likewise given.

Q. 254. Let us assume, then, that the governor element actuating the link rod "17" is a purely speed-sensitive element. What, then, will be the operation of the actuated parts we are discussing after the water-wheel gates have moved to their new position, responsive to governing action and before the speed-sensitive device has returned to its normal speed, and its parts have assumed the corresponding final positions normal after a governor action. Will there or will there not be further movement of these enumerated parts prior to the speed-sensitive element assuming final and normal position of the parts, to cause overrunning of the governor?

A. Considered as a speed-operated device, the governor would "hunt" and would overrun first in one direction and then in the other, and, if it should come to rest at the proper gate opening, it would be after a considerable period of time, and comparatively a large number of operations in both directions.

Q. 255. Could or could not these several features of this "Berry Blueprint No. 1" either with the attempted governor devices therein shown or with the speed-operated or speed-sensitive governor device you have referred to, acting in substitution therefor, perform the functions of a Lombard governor including the features of "Complainant's Exhibit W," or of the governor of the patent in suit,

"Complainant's Exhibit A," including the returning device which you have described as disclosed therein?

A. No; it could not.

Q. 256. And would or would not the damaging and improper actions and results occur which you have referred to when such Lombard or like governing device was not employed or was improperly adjusted, namely, interference with proper operation of the motors of a traction system, and with pump-operating motors, lights and the like, upon the circuit supplied by the apparatus so governed?

A. All the objectionable results which would proceed from speed variation would be present in a system driven by water wheels controlled by the device disclosed in the blueprint "Defendant's Exhibit Berry Blueprint No. 1".

Q. 257. I now show you five sheets of paper bearing sketch and sketch-designating matter, lettered "A", "B", "C", "D" and "E", respectively, being respectively "Complainant's Exhibits Wilson Sketches A, B, C, D and E," and I will ask you if you have examined the same.

A. Yes; I have examined these sketches.

Q. 258. As to the several valves therein shown, is it possible in any manner to classify the same generically with respect to valve movements and actions and, particularly, the relations between the valves and their seats or co-operating parts in such valve actions?

A. Yes.

Q. 259. Please so classify them generally.

A. The valves shown in sketches "A" and "B" are generically different from the valves shown in sketches "C", "D" and "E".

Q. 260. What is the generic difference so existing?

A. The valves shown in sketches "A" and "B" are free-moving partially or totally balanced valves which do not contact with valve seats except when in a completely closed position, and which do not slide on the valve seats, and, therefore, in which no friction can exist between the valves and the seats. The valves shown in sketches "C", "D" and "E", with the exception of the water-wheel gate shown in sketch "C", are all valves which are in constant frictional contact with the seats or the surrounding portions thereof. Furthermore, none of the valves shown in sketches "C", "D" and "E" is a balanced valve. The difference between the two types, as generically classified, mechanically is simply this: that one valve is easily moved from one degree of opening to the other, while the other type requires a comparatively great force or amount of power to operate it.

Q. 261. Which type requires such comparatively great amount of power to operate it? That is, which class?

A. The unbalanced valves having frictional contact with the slides or surrounding parts, such as indicated in sketches "C", "D" and "E". In sketch "C" I refer, of course, only to that valve labeled "by-pass

valve." The water-wheel gates shown in sketch "C" are of a mixed type, having friction on two of the sides only, and they, therefore, represent a more easily moved valve than the others shown in Sketches "C", "D" and "E".

Q. 262. And how about the water-gate valve shown in Sketch "B"?

A. They are of the same type as the valve shown in sketch "C", the characteristics of which I have just mentioned.

Q. 263. Does the by-pass valve shown at "48" in "Complainant's Exhibit A," the patent in suit, fall within either of these general classifications, and, if so, which?

A. It falls in the same classification as the valve shown in sketches "A" and "B".

Q. 264. And in selecting such type of by-pass valve in the working out of your invention and the disclosure in the patent, why did you make such selection?

A. Because this is one form of a balanced and substantially frictionless valve, and for successful governing some type of by-pass valve having these characteristics is necessary. In other words, it would have required a machine of such size, strength and cost to operate an unbalanced valve having friction, that the device would be commercially impracticable.

Q. 265. I refer you now again to "Defendant's Exhibit Berry Blueprint No. 1," and call your attention to the water-gate valves shown therein as at

"48", attempted by-pass valve shown therein at "41", and will ask you if either of these falls within either of the classifications you have just made and, if so, which, and within which classification.

A. As I understand the drawing of the water-wheel gate valves and the by-pass valve, both belong to the same type. That is, rotating valves which are completely surrounded by the valve seats and which, therefore, must be subject to considerable friction if the valves are reasonably water tight. They, therefore, come within the classification in which the valve is shown in sketches "C", "D" and "E", previously described, would fall.

Q. 266. Is there any general name by which the attempted water-gate valves and the by-pass valves in the blueprint last referred to are known in the trade or art?

A. Yes; they belong to the type known as plug cocks.

Q. 267. And what have you to say as to the effect upon the same of service fluid pressures, such as would be encountered were they subjected to the pressure of penstock water in water-wheel parts, and as opposing movement of the same in their seats?

A. Plug-cock valves, except in small sizes, are very difficult to move even when the water pressures acting against them are not considerable. This is evidenced in the ordinary daily experience of nearly everybody in handling usual plug-cock valves at wash-basins and elsewhere which usually have a plug

or rotating member of less than $\frac{5}{8}$ -inch in diameter. In plug-cock valves of such dimensions as would be necessary to handle the large quantity of water necessary for the operation of even a small hydro-electric plant, the energy required to move them would be comparatively very great. Just how much this energy would be, would depend, of course, on the construction, the co-efficient of friction between the parts, the diameter and other factors. But, in any case, I would consider the operation of plug-cock valves for any purpose in connection with handling considerable quantities of water as commercially impracticable.

Q. 268. And what would the result be in attempting to operate such plug-cock type valves in such water wheel practice where the same were attempted to be actuated by a sensitive governing element?

A. A governor suitable for operating valves of this type in controlling the speed of water wheels would have to be so large and costly that it would be a commercial impossibility to construct and install it.

Q. 269. Now, let us assume that fine sand or schist or other comminuted matter found its way between such plug-cock valves and their seats. What would be the effect of the frictional factor so introduced upon the otherwise difficulty of moving such valves?

A. It would greatly increase the energy necessary to move such valves, the amount of it, of course, de-

pending on the character of the workmanship and the degree of water-tightness of the valve. In any case, the order of increase would be that of several times the frictional resistance which would exist when no sand or other foreign substance was present between the plug and its seat.

Q. 270. Now, if in connection with plug-cock valves so employed or attempted to be employed in water-wheel regulation, water were used like that of "Complainant's Exhibit Bottle of Kern River Water at Power Development Company Plant," and having the visible content of such sample of water, what would be the effect upon frictional co-engagement of the plug-cock valves and their seats in the attempted operation of the plug-cock valves by the governor apparatus?

A. I do not consider that the content of the water as visible from this sample would change the frictional resistance to the motion of a plug-cock valve, and, if it should, the change would be so small as to be practically negligible.

Q. 271. By such optical examination as you can make of this sample of water, do you find any reason to believe that the application of such water to these plug-cock valves would or would not vary the action of the valves upon their seats, as compared with the friction of chemically pure water without content whatsoever?

A. There is nothing visible in this sample of water which could change to any appreciable degree

the frictional resistance to motion of the plug-cock or other form of rotating or sliding valve.

Q. 272. Referring again to "Complainant's Exhibit A," will you please state whether or not at the time you conceived your invention therein disclosed the several electro-magnets, contact devices, including the mercury cup contacts, the solenoid and the electric generator, and the various other features providing for electrical transmission and for making and breaking electrical circuits, were well known in the art?

A. All of these elements were well known as individual devices and had been in use prior to my conception of the idea of combining them for the specific purpose described in the patent.

Q. 273. Is the same also true of the several levers, rods, links, bell-crank and the gears, clutches, friction discs and other mechanical features disclosed in this patent?

A. Yes; it is true of every portion of the patent except the combination of the bell-crank "42" and the curved slot "44" in the end of the lever "43" as shown in Fig. 6 of the patent in suit. This I believe to be a mechanical device original with me. But, except this, all the other parts were well known in the electric and mechanical arts.

Q. 274. And had those parts last specified, well-known mechanical equivalents at that time?

A. Yes. Those parts were a substitution for other methods for performing the same function as disclosed in the original sketches.

Mr. Blakeslee: Counsel for defendant may cross-examine.

CROSS-EXAMINATION

By Mr. Westall:

XQ. 275. How many concerns in the United States are there which manufacture or sell water-wheels or water-wheel governors, if you know, approximately?

A. I do not know, but I do know that the number exceeds thirty.

XQ. 276. You have stated that prior to and since the granting of your patent you have been in communication at various times with those who manufacture and sell water wheels and water-wheel governors, in an attempt to interest them in the device of the patent in suit. I will ask you to please mention the names of the concerns which you there approached.

A. I do not now recall them all. I have approached the Lombard Governor Company several times, the Woodward Governor Company, the Pelton Water Wheel Company, the I. P. Morris Company, the Allis-Chalmers Company, the S. Morgan Smith Company, the Platt Iron Works Company, the Wellman-Seaver-Morgan Company, the Sturgis Governor Company, besides others whose names I do not now recall.

XQ. 277. At what time during the interval between the grant or between your first conception of the invention of the patent in suit and the assign-

ment to Mr. Henry of the patent, did you communicate with these various companies and individuals which you have referred to in your previous testimony?

A. The original communications and the subsequent attempts at negotiation covered the entire period from nearly four years prior to the grant of the patent up to the time I sold it to Mr. Henry. Within sixty days before my negotiations with Mr. Henry began I had again discussed the matter of selling the patent to the Lombard Governor Company.

XQ. 278. Had your efforts during the last three or four years prior to the assignment of the patent in suit to either sell or to compel some kind of a settlement for alleged infringements by any of the companies or individuals which you have mentioned, been carried on with as much vigor as they had been prior to that time?

Mr. Blakeslee: Objected to as calling for a mere arbitrary conclusion based upon facts impossible of weighing as to the conclusion.

A. As to the relative zeal and vigorousness with which I prosecuted the attempts to obtain settlements or to effect sales of the patent during different periods of my ownership of it, it would be difficult for me to say. By the time that Mr. Henry began negotiations with me for its purchase, I had nearly exhausted the possibilities for doing anything with it, so far as my own ability was concerned. I had begun by offering it in the early days of my ownership to practically every interest that in my opinion

might become interested. As one after the other of these parties would decline to either purchase the patent or take a license under it, the possibilities began to narrow more and more, and, naturally, with this diminution in possibility, there was a corresponding reduction in the amount of time which I gave to attempting to utilize the patent, although I at no time ceased my efforts to place it or sell it, and the intervals which elapsed between attempted negotiations were produced partly by the fact that within the past few years there were but few openings for it, and also it was necessary for me to devote practically all of my time to my professional work, as I was, and am, without income from any other source.

XQ. 279. By Mr. Westall: Did you threaten suit against any of these concerns for alleged infringement of the patent in suit at any time?

Yes; at various times. I called the attention of certain companies to the fact that they were manufacturing devices which infringed my invention, and that it was my intention to bring suit unless a satisfactory settlement were made.

XQ. 280. Against which of these concerns or individuals mentioned by you in your previous testimony did you make these threats of suit?

A. The Allis-Chalmers Company, the Pelton Water Wheel Company, the Lombard Governor Company, the threats of suit being made by me personally. About the year 1910, if my memory is correct as to the date, I placed the patent in the hands of Mr. H. C. Messimer of New York, and asked him

to make preliminary statements to certain of the infringers with regard to the necessity of their making some settlement. I do not now remember the companies with which he communicated with the exception of the Sturgis Governor Company. I may add that one of the difficulties which I labored under was the fact that I was very well known to most of the manufacturers or to some of their representatives, who fully understood that, being dependent upon my professional work for income. I was not prepared to bring a suit which I could actually fight through to a final decision, and it is possible and, in fact, I think probable, that this condition greatly affected the conclusions that the several companies infringing this patent reached, namely, that there was no necessity to give serious consideration to my claims or my suggestions of suit.

XQ. 281. And who was this Mr. Messimer in whose hands you placed the matter of threatening these companies in 1910, as you have testified?

Mr. Messimer is a patent attorney whose offices are in the Liberty Tower Building in New York City.

XQ. 282. And how long was that matter in the hands of Mr. Messimer?

A. I believe it was in his hands fifteen or eighteen months. In this time Mr. Messimer, when he had the opportunity, communicated with certain infringers of the patent, though as I have before stated I do not remember now who they were, excepting the Sturgis Governor Company.

XQ. 283. And did Mr. Messimer advise you to bring suits against any of these different concerns?

A. Mr. Messimer advised me that it would be proper for me to bring suit under the conditions of the infringement and the existence of the patent. But Mr. Messimer, being my own attorney in other matters, was fully aware of the impossibility of my entering into and carrying on a suit to its final conclusion.

XQ. 284. In other words Mr. Messimer was doubtful as to the outcome of such a suit if one had been instituted?

A. He never indicated that he was doubtful of it. He was fully assured that I was not financially able to carry on such a suit, regardless of whether the outcome was doubtful or not.

XQ. 285. And so he never expressed any opinion to your recollection as to the probability of success of such a suit?

Mr. Blakeslee: We object to this manner of cross-examination as not calling for the best evidence, not cross-examination, and as seeking not only for a matter of opinion but for a matter of repeated opinion, and, furthermore, as entering into matters of privileged communications between client and his attorney, and not proper to be inquired into at this time and of this witness. The question would certainly be barred if asked of the Attorney Messimer, and as the best evidence would be that of the Attorney Messimer, and such evidence would be properly barred, the question is manifestly improper and not

within the laws of evidence. And we furthermore warn the witness of his rights in this respect and as to any matters pertinent to advice and consultation as between the witness and his counsel, he need not answer the question unless instructed by the court.

Mr. Westall: Counsel is correct in his statement that the question asked of the attorney would be improper. But he is manifestly in error in stating that such a question is improperly asked of this witness. It is submitted that the question is entirely proper, and the instruction of counsel to the witness not to answer can only have been given on the theory that some evidence damaging to his side of the case would be brought out.

Mr. Blakeslee: We object to this statement of counsel as argumentative and forbidden by Equity Rule 51, and again call the attention of counsel to the portion of our objection which is that the question deals with a mere matter of opinion and not a matter of fact, and as not being proper cross-examination.

A. Mr. Messimer not having been retained by me to carry on a suit, did not fully investigate the patent nor the character of the infringements. He acted on my representation that my patent was a pioneer patent, that the invention antedated any possible use of the elements therein shown, and that the parties whom I mentioned to him were making similar structures. And on the basis of these representations by me, he communicated with the parties who I claimed to be infringers. I do not recall that Mr. Messimer ever made any statement about the

outcome of the suit, because it was well understood between us that I was not in any position to bring a suit, and, therefore, I do not remember ~~that~~ this matter was discussed at all. I, however, do know that Mr. Messimer would never have made a demand for settlement if he were not reasonably sure in his own mind that there was proper ground for doing so.

XQ. 286. By Mr. Westall: How long before your application for the patent in suit had you been engaged in the profession of engineering in any of its branches?

A. I began in practical engineering work in certain manufactories in which my father had an interest at the age of about fourteen years. I began my engineering study at the age of about sixteen—

XQ. 287. (Interrupting) I perhaps can shorten the question by saying that I mean the time when you were earning your living from your engineering practice.

A. I began my living from my engineering practice prior to the completion of my college education. I spent one year in practical work in machine-works before going to Stevens Institute. This was subsequent to the time when I attended the University of Georgia. I left Cornell University in the summer of 1894 and immediately began making my living in engineering work. I therefore had been so engaged subsequent to leaving college,

XQ. 288. Have you since entering the engineering profession been fairly successful?

Mr. Blakeslee: Objected to as calling for a con-

clusion, as to which the witness is possibly not the best evidence, and it does not call for a statement of facts as to the work done by the witness, as to which the evidence is already complete.

A. It would depend on your definition of the word "success." If it means the production of new devices and investigation of new methods, of various engineering—

XQ. 289. By Mr. Westall: (Interrupting) Assuming that it means success in a financial way, as ordinarily understood.

Mr. Blakeslee: Objected to as indefinite, and upon the same grounds last urged.

A. I would not say that I have been successful financially, because my expenditures have consistently reached if not exceeded my earnings.

XQ. 290. By Mr. Westall: Could you state in a general way approximately what your expenditures per annum have been?

Mr. Blakeslee: Objected to upon the same ground, and as not proper cross-examination, and as inquiring merely into the private affairs of the witness, and in that respect not tending to prove or disprove any of the matters in controversy here, and being merely a question of busy-body nature. The witness is informed that he need not go into details at all, unless instructed by the court.

A. I would scarcely care to lay on public records matters of private personal expenditure with the correlative information of my specific obligations which cause these expenditures. I can only state

that the ratio between my income and expenditures for the maintenance of my engineering office and of my family and such other obligations as I have been obliged to meet, have been such that I have never had a sufficient surplus to have undertaken any enterprise which required even a small amount of capital.

Mr. Westall: In response to counsel's statement of record, it is pointed out that the witness has testified that he has not been able financially to bear the expense of a suit for infringement of the patent in suit, and that the inquiry is directed to bringing out specifically the nature of his financial condition, so that the court may judge whether his conclusions as expressed on direct examination are well founded, and that, therefore, the question calls for a more specific answer as to just what his obligations were. With this explanation of the object and purpose of the question, the Examiner is requested to repeat the question.

Mr. Blakeslee: We repeat our objection. The witness has stated a fact, and not a conclusion. It costs varying sums of money to bring and sustain suits for infringements of patents, and the witness may have had \$10,000 available for such purpose and have considered that that would have been insufficient to bring such suit. Therefore, there being no standard to go by, the statement of fact by the witness as to his inability to sustain and maintain such suit is as far as any such inquiry could go. If counsel wishes to ask the complainant if at any time he

had \$10,000 available to bring and maintain such suit, we will not object to the question. But the question prying into the financial affairs of the witness is manifestly improper and unwarranted.

A. I am willing to make a partial answer to the question, which is to this effect: that at no time in my career have I been able to devote as much as \$3,000 to the prosecution of a suit of any kind, nor have I been in position to have expended that much money even if I had been absolutely assured that within the course of legal events I would have been granted a full judgment for whatever claim I might have made.

XQ. 291. By Mr. Westall: Did any of the concerns against which you threatened suit make, sell or use any device, which might properly be described by the claims Nos. 6 and 7 of the Lyndon patent in suit?

Mr. Blakeslee: Objected to as calling for a legal conclusion, improper cross-examination, the claims being integral parts of the patent in suit and requiring interpretation as to their scope, and as to which the court has the prerogative.

A. I had never seen a governor in which the elements shown in claims 6 and 7 were present, so far as I know, and my claims on the various companies which I alluded to were made on the basis of statements which came to me that equivalent constructions were being used.

XQ. 292. By Mr. Westall: So that you did not personally investigate or have any personal accurate

knowledge as to just what was being made by any of the companies against which you made the threats of suit?

A. Yes; I made investigations of a certain kind, which would have been sufficient to have instructed an engineer, although I believe might not be accepted as legal proof. For instance, in the case of infringement by the Allis-Chalmers Company, this I was informed first took place in the installation of the Great Northern Power Company at Duluth, Minnesota. I wrote to the chief engineer of the company and asked him about the construction, and he replied informing me that a by-pass valve had been supplied by the Allis-Chalmers Company, operated inversely to the main gate by the governor mechanism, and arranged to return slowly to its normal position. From this I reached the definite conclusion that there was an infringement. Never having seen the structure, I am unable to relate it to the claims numbers 6 and 7 of the patent in suit further than these statements would relate to these claims.

XQ. 293. But you believed from those statements that it did relate, and you did believe that it was covered by those claims or some of the claims of the patent in suit?

A. I was positive of it.

XQ. 294. And when did you hear of this installation and when was it manufactured and used to your knowledge?

A. To the best of my memory all this occurred in the year 1904. When it was manufactured, I do not

know. I simply heard of the installation and wrote about it. It might have been just installed, or it might have been in operation two years. I only heard it was installed.

XQ. 295. Please state the circumstances as to time and place and construction of apparatus which were incident to your threats of suit against any of the other companies that you have referred to as having been threatened by you with suit.

A. They were all based on statements which came to me, sometimes made to me by other engineers who knew that I was interested in the matter of speed control of water wheels, and sometimes from discussion of plants published in the various technical journals. It is impossible for me at this time to remember the dates and the circumstances attendant upon each one of these. Sometimes the communication was, as I have mentioned entirely verbal, but made with the positiveness of an eye witness and by an engineer competent to judge. On the basis of such statements, whether verbally made to me or appearing in technical journals, I would communicate with the companies who it was stated were making the infringing apparatus, in an attempt to obtain a recognition of the rights granted me under the patent in suit.

XQ. 296. Did either company to your knowledge at any time prior to 1904 ever make any construction which seemed to you to be covered by any of the claims of the patent in suit? And, if so, when, and under what circumstances.

A. As I have testified, I am not now certain that 1904 was the date of the revelation to me of the infringement by the Allis-Chalmers Company, but to the best of my memory that was the year in which this took place; and, as far as I now remember, it was the first knowledge I had of infringement, on the part of any manufacturer, of this device.

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XQ. 297. Regarding the device used by the Allis-Chalmers Company, and I believe installed, as you have testified, in Minnesota, were you interested in following up the device so as to find out whether or not it was successful in its operation? And, if so, what did you do towards keeping track of the installation referred to?

A. I secured no information concerning it other than that which I have already testified to, which was given to me by the chief engineer of the Great Northern Power Company, namely, that of a bypass valve moved by the governor inversely to the main gate, which, when governing was completed, would return slowly to its normal position, was installed. As to the mechanical details by which it was affected and the results obtained. I did not enter into this, as I assumed that it would not have been in use at the time the engineer of the company wrote me, if it had not been successful. I made no efforts to secure any further information concerning it, as I considered this sufficient for the establish-

ment of the fact that my patent was being infringed, and that the use of the by-pass of this character was deemed necessary by the engineers of the Allis-Chalmers Company and of the Great Northern Power Company then in a measure confirming my own view of the necessity for such an auxiliary device.

XQ. 298. And how long, to your knowledge, had that device been in use before you first heard of it?

A. I do not know. When I heard of it and wrote the engineer of the power company, my request for information was limited to whether or not such a device was in existence and in operation there, and I made no inquiry as to its age nor the results that were being obtained.

XQ. 299. How did you happen to discover or become suspicious that such a device was being used, before you wrote to the engineer?

A. I am under the impression that I was verbally informed, and I think it was at the Engineer's Club in New York that this information was first given me.

XQ. 300. And when was that?

A. It was within a comparatively short time before I wrote to the Great Northern Power Company. I should say possibly ten days or two weeks.

XQ. 301. And what part of 1904 do you think it was.

A. I believe it to have been either in the summer or early fall. As I have stated, I have no means of now recalling the exact date without reference to

the correspondence between the enginer of the power company and myself.

XQ. 302. Are you sure that it was not earlier than 1904?

A. No; I am not sure that it was not. I have merely given you my belief that, as near as I can remember, it was about eleven year ago.

XQ. 303. Now, your understanding of the construction of that device, what claim or claims of the patent in suit did you consider were infringed by it?

Mr. Blakeslee: Objected to as calling for a legal conclusion on the part of the witness. What is infringed is the patent, and the matter must obviously have been a question of consideration of the subject of the invention, the subject of the patent, and obviously for the witness to attempt to make any post-election at this time is uncalled for. The witness has told what he knew and was informed of the nature of this infringement, and it is not for him to construe the patent legally and apply it to such question of infringement.

A. My memory is that I considered more particularly claims 6 and 7 to be infringed, though I am not now sure whether I considered other claims in the patent to have been infringed.

XQ. 304. By Mr. Westall: Did you consider that the device installed by the Allis-Chalmers Company at Duluth, Minnesota, in 1914, contained within it "a returning device for said controller provided with actuating means controlled by said controlling means to return the controller to inoperative posi-

tion so as to prevent excessive movement of the governor" as disclosed in claim 4 of the patent in suit?

Mr. Blakeslee: Objected to as irrelevant, immaterial and incompetent, and calling for a mere statement of opinion and expression of opinion, and not calling for an expression or statement of facts, not the proper method of proof, the best proof being what the apparatus itself was, and the witness has testified that he had not seen the apparatus; and having given the best evidence he can give as to what that apparatus was, a comparison of it with the subject of any descriptive mechanical language is not the proper method of proof as to what it was or as to what relation there may have been between it and the patent in suit.

A. I did not know anything concerning the details of the governor mechanism itself, except that if it were operative it must have some form of returning device, and at that time I was more specifically interested in the by-pass valve; and if my memory is correct, I did not make any allegation that all the claims in the patent in suit were infringed. Just how many of the claims and which ones I relied on at the time, I do not remember, but I am sure that among these were included claims 6 and 7, and that I had principally in mind the feature covered by these claims.

XQ. 305. By Mr. Westall: You never investigated fully to find out exactly what that mechanism was in order to know whether or not it might be cov-

ered by some of the other claims of the patent in suit, did you?

A. No.

XQ. 306. I show you "Complainant's Exhibit G," and "Complainant's Exhibit J," and ask you if you recognize and understand the operation, function and purpose of the two governors that are illustrated in the exhibits referred to?

Mr. Blakeslee: We object to the question on the ground that there is no foundation laid for it, the witness not having been asked whether he has ever examined these exhibits, which are photographs.

XQ. 307. By Mr. Westall: I simply ask you whether you do understand them, and not to describe them.

Mr. Blakeslee: And the record not showing that he has ever examined them.

A. I cannot say that I understand these exhibits from this examination of them or that I would fully understand them without the aid of some description or mechanical drawings that would illustrate more clearly the parts in their relations. There are, however, a good many of the parts that have a familiar look and apparently are the same as parts on other governors with which I am familiar.

XQ. 308. By Mr. Westall: Do you recognize either of those governors as a Lombard governor?

Mr. Blakeslee: The same objection.

A. I recognize many of the elements of the Lombard governor in them both, and I would believe, without further information on the subject, that

they were made by the Lombard Governor Company.

XQ. 309. By Mr. Westall. How long to your knowledge have governors of that type been made, used and sold by the Lombard Governor Company?

A. I am unable to say. The Lombard Governor Company was, so far as I know, one of the earliest manufacturers of these machines in America; and the general type of governor illustrated in the photograph "Complainant's Exhibit J," illustrates the form of governor, which, with modifications, that company made, for a number of years. The vertical type of governor shown in the photograph "Complainant's Exhibit G," was developed at a considerably later period. Just what the dates were of first placing these two types on the market, I do not know; nor can I even approximate, except that the vertical type was certainly produced at least five or six years after the horizontal type.

XQ. 310. And can you state when you first heard of or saw either of these types of governors?

A. No; it would be impossible. I have known throughout the period of my engineering experience in America, dating from the early part of 1898, that the Lombard Company was making a water-wheel governor; but as to how long they had been making each of these types, I have no idea.

XQ. 311. Would you say that it was as long as ten years ago?

A. I have testified that certainly as long ago as sev-

enteen years ago the Lombard Governor Company was manufacturing water-wheel governors.

XQ. 312. And to your knowledge were they of the same general type as those which are illustrated in "Complainant's Exhibit G," and "Complainant's Exhibit J," which you have before you?

Mr. Blakeslee: We object to this as merely repetitions, the witness having testified that he has no idea as to when these types of governors first came into the market.

A. I know that the type shown in "Complainant's Exhibit G," was developed sometime subsequent to the year 1902. I believe it never appeared before 1906, but I am not sure enough of these impressions to give them as more than impressions. The horizontal type of governor, such as is illustrated in "Complainant's Exhibit J," was the earliest type. I am now referring to the operating mechanism, and not to the speed-controlling device. I do not know, and have not even an impression of the time when the speed-control device was changed to provide for a variable opening of one of the holes in the dashpot, which action I have previously described on direct examination.

XQ. 313. By Mr. Westall: When did you first write to the Lombard Governor Company at Ashland, Massachusetts, regarding the purchase of your patent, the patent in suit?

A. I do not now remember. I do know that it was prior to the removal of that company from Boston, where its works originally were located, to the present works at Ashland.

XQ. 314. Is there any way that you can approximately fix the date of your first writing to the Lombard Governor Company concerning the patent in suit?

A. I have not even an impression of the time further than that mentioned, the reason being that from the date when this invention first took form until I finally sold it to Mr. Henry, I continually offered it in every available direction, and in the case of the Lombard Company, the matter was brought up two or more times, and I know that an interval of some years passed between the first time and the second time; but to locate these times and attempts to sell the patent to the Lombard Company, would be impossible for me now, although I believe the characteristics of the management of that company are such that the correspondence is still on file.

XQ. 315. Do you believe that you took this matter up with them prior to 1904?

A. I am under the belief that I took this matter up with them prior to 1902. I have no surety of it, and I only judge of this by the fact that in the four years that elapsed from the date of my invention in 1898 until 1902, I persistently offered the invention in every direction that seemed to me to be open.

XQ. 316. Was it your contention at the time you first took this matter up with the Lombard Governor Company that the devices they were then making were infringements of your patent or of any of the claims thereof.

A. I think I made no contention of any kind, that I simply laid the subject matter of the patent or the patent application before them and asked that they give con-

sideration to all the features of the invention, and, if they found that these incorporated anything new or valuable to them, that I would be glad to enter into negotiations with them for the disposition of the patent.

XQ. 317. When, if ever, did you threaten suit against the Lombard Governor Company for alleged infringement of your patent or any of the claims thereof?

A. An agent of the Lombard Governor Company was in my office either four or five years ago, showing me some of the new types of governors that had been developed, and I called his attention to the necessity of certain features which the governors very apparently did not have, and he made the statement that these features were going to be added to the then type, and I told him that if they were added that I would bring suit against the Lombard Governor Company. Later Mr. Garratt, engineer and general manager of the Lombard Governor Company was in my office. This I believe to have been about three and a half years ago. And I told him that I felt that unless he purchased the patent which I owned and which is the patent in suit, his company would become liable to me for infringement, and that it was my intention if I could so arrange matters to do so, to bring suit against his company or any other infringers that I might know of. These statements, I believe, constituted my threats to bring suit against the Lombard Governor Company, although it might be that Mr. Messimer also wrote to the Lombard Governor Company at the time I have previously testified about. In the absence of Mr. Messimer's correspondence, I, however, am unable to say definitely about this.

XQ. 318. When did these conversations take place, and when were these verbal threats made that you have described in your last answer?

A. About the times which I have before mentioned, the first one made between four and five years ago, and the second one made some eight or ten months thereafter. I fix those dates by the fact that I was in one portion of the building at 60 Broadway when the agent of the Lombard Company called on me, and I had moved my office to another portion of the same building when I had the discussion later with Mr. Garratt, and it is by a general knowledge of the time that I occupied these two different offices that I am able to roughly approximate the dates of these discussions.

XQ. 319. Have you closely followed the development of the water-wheel governing art since the time of your alleged invention of the subject matter of the patent in suit?

A. I have kept informed on this subject, partly because of my interest in it that would proceed from the patent, and also because my professional practice has required it.

XQ. 320. In threatening the Lombard Governor Company with suit for infringement, what particular features or parts of the patent in suit or what particular claims therein did you have in mind as being infringed by them?

Mr. Blakeslee: Objected to as not cross-examination, and as calling for an interpretation of the patent with respect to the infringement, and not a comparison of structures.

A. I know that claims 6 and 7 were among those

which I brought to the attention of the Lombard Company. I am under the impression that the entire patent, however, was discussed and in the conversation with Mr. Garratt, I believe I was more concerned in pointing out the advantages which would accrue to the Lombard Company by the adoption of the design of my entire governor than the question of infringement, and the whole subject was discussed, although, as stated, I informed Mr. Garratt that I had been informed that his company was making infringing structures and it was my intention to protect whatever rights had been granted me by the Patent Office if I could make proper arrangements to do so.

XQ. 321. By Mr. Westall: Will you please describe the device which at the time of your first threat of suit against the Lombard Governor Company was being manufactured, used or sold by them, and which you conceived to be an infringement of any part or parts or claims of the patent in suit?

A. I do not know the mechanism which the Lombard Company proposed to add to its governors, except that the agent of the company who first called on me informed me of the intention of the company to place automatic inversely operated slow returning by-pass valves on their governors, and I felt that this in addition to the other features of the Lombard structure with which I was familiar, was so clear and obvious a case of infringement that I could induce the Lombard Governor Company to take some action without recourse to the courts. I did not, therefore, consider the relation of the then existing Lombard structure with the claims of my patent, as there

were some of the elements in my complete invention that the Lombard Company had up to that time not made use of, namely, the by-pass valve. After this was added it would be a complete infringement and then, to my mind, it became obvious that the company could then be induced to take some action. I had never seen a Lombard governor with the by-pass valve attached, and I do not now know by what mechanism that company intended to cause the action of such valve, although I have been familiar with the machines of that company for many years.

XQ. 322. You did not consider, then, at the time of your first threat of suit against the Lombard Governor Company that any form of governor which they were then making or had previously made infringed any of the claims of your patent, or would infringe those claims, unless a by-pass was added to the structure of the valve, operated inversely to that of the water gate, as described in claims 6 and 7 of the patent in suit. Is that correct?

Mr. Blakeslee: Objected to as placing an improper construction on the testimony of the witness, to which reference is made, and that it is misleading in that respect.

A. As to my state of mind concerning the relation between the machines as then made by the Lombard Governor Company, and the construction called for by the patent in suit, I cannot now say. I know that I did not consider that I had a clear and absolute case against the Lombard Company, which, in itself, was so obvious that I could obtain settlement from them without going to the courts, until they had completely infringed all the

conditions of the claims of the patent in suit. This, however, was my own judgment in the matter, which may or may not have been correct.

XQ. 323. By Mr. Westall: At or prior to the time of your first threat of suit against the Lombard Governor Company, had you had the advice of any patent attorney concerning alleged infringement of any device or by any device of your patent?

A. I have never had the advice of any patent attorney as to whether or not any structure infringed the claims of my patent. I had a superficial familiarity with the general terms of patent claims, and what they described, and felt that I was able to form a conclusion as to infringement. As to the wisdom of any such view, I am unable to say. This, however, was my view, and I acted on it. But I have never had any patent attorney take my patent which is the patent in suit, and compare it with some existing structure and from this comparison advise me as to whether such existing structure infringed the claims of my patent, and if so, at what point and in what manner.

XQ. 324. Were you well informed as to the different kinds of governors the Lombard Governor Company was making prior to the time of your first threat of suit against them?

Mr. Blakeslee: Objected to as merely repetitious.

A. I was thoroughly well informed on the subject of the construction of Lombard governors, as I have before testified. In common with every other company, the product of this company has progressively been improved. The knowledge that any engineer has of the product of a certain company is usually sporadic. If an

engineer has a water-power plant to construct at one time, he then thoroughly investigates all the existing governors, or, at least he should do so. After making a selection, it may be two years or three, or possibly longer, before he has another water-power plant to construct in which it is necessary for him to use governors. He then again examines all the governors on the market, because within that period of time considerable changes may have been made not only in the art, but in the structures of the manufacturers engaged in the business. So for this reason the knowledge of any engineer, unless he is continually engaged in one specific branch of the art, is thorough and definite only at intervals, so that in the course of a number of years he has a knowledge of the various machines and the development they have passed through; but this knowledge has not continuity.

XQ. 325. By Mr. Westall: When did you first bring the device of the patent in suit to the attention of the Pelton Water Wheel Company of San Francisco in an endeavor to interest them in the purchase of the patent in suit?

A. I cannot say. My memory is that in 1904 I communicated with the Pelton Company and sometime again in 1907 or 1908 I called at the New York office of the Pelton Water Wheel Company and stated to Mr. Kunze, the manager of that office, that I had been informed that the Pelton Water Wheel Company was engaged in the manufacture of governors, and, further, that the structures made by his company were infringements of my patent, and I made a request that he take the matter up with the home office and see if we could not enter into some business negotiations covering the situation.

XQ. 326. Your first communication with the Pelton Water Wheel Company in 1904, in what form was that communication?

A. I believe it to have been in the form of a letter to the company.

XQ. 327. And what was the subject matter of that letter?

A. If I remember correctly, it simply called the attention of the company to my invention and suggested that it might be of interest to them. At that time, so far as I know, the Pelton Water Wheel Company was not engaged in the manufacture of governors.

XQ. 328. What reply did you receive from the Pelton Water Wheel Company to that communication?

A. I do not remember. It is my belief that the reply indicated that the Pelton Company was not interested in manufacturing governors, and did not intend to become interested in their manufacture, but I am not sure on that point.

XQ. 329. I wish you would give as near as you can the exact date of your conference with Mr. Kunze of New York—the New York manager of the Pelton Water Wheel Company—regarding the patent in suit.

A. That it would be impossible for me to do, and I do not recall any other event or any document to which I could relate the circumstance. I believe the interview to have been held in the office at 90 West Street, New York. Therefore, it was subsequent to the construction of that building, and this is the only factor that would limit it as to the distance in the past.

XQ. 330. Could you give approximately the year?

A. I can simply limit it. I know that it was not prior

to 1906, and I know that it was not later than 1910. I have no way of bringing these limiting periods closer together, except as a general impression that it was 1908. I wrote so many letters and made so many efforts to dispose of this patent, that it is almost impossible for me to separate out any individual case, unless there is some collateral circumstance that would have fixed the date in my mind.

XQ. 331. Did you at that time threaten the Pelton Water Wheel Company with suit for alleged infringement of your patent or any part or claim thereof?

A. I remember telling Mr. Kunze that if his company was making governors which infringed my patent it was my intention to seek redress in the courts unless some business arrangements were made between the Pelton Company and myself.

XQ. 332. And what was your theory or idea regarding the bringing of a suit against the Pelton Company? That is to say, what part or claim of your patent, if any, did you conceive to be infringed by any structure that they were then or had theretofore been making?

A. I had not at that time ever seen a Pelton governor, and the only way in which I concluded that the Pelton Company was infringing my invention was from either a statement made to me of some article in a technical journal, which I cannot say, that indicated an infringement of the patent. I do not remember the details that would cover all the infringement, except I distinctly remember that one of the features was the by-pass valve as covered in the patent. What other features, if any, I was informed on, I do not now remember. But I am sure there had been

a sufficiency of statements made to indicate an infringement of the patent. That there was any such infringement was later denied by the Pelton Company.

XQ. 333. Do you remember the form in which this denial of infringement was communicated to you by the Pelton Company?

A. I believe that it was made to me verbally about a week after my first call on Mr. Kunze, or possibly a later time when I made a second call to inquire as to the result of my first interview with him.

XQ. 334. Were you acquainted or did you know of Mr. George J. Henry, Jr., the complainant in this case, at any time that you were conducting negotiations with the Pelton Water Wheel Company concerning your patent?

A. No; I did not. I was not personally acquainted with him, and did not even know of him.

XQ. 335. Did you know at that time that he was connected in any way with the Pelton Water Wheel Company?

A. No. I never knew until within the past four days that Mr. Henry had been at one time connected with the Pelton Water Wheel Company.

XQ. 336. Did the Pelton Water Wheel Company in the denial of the infringement which you have described state any reasons why they thought they did not infringe upon your patent? And, if so, what were those reasons, if you recall them.

A. I do not remember that any reasons were given. My memory is that the statement was simply that the matter had been referred to the head office of the Pelton